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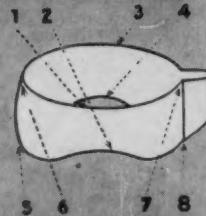
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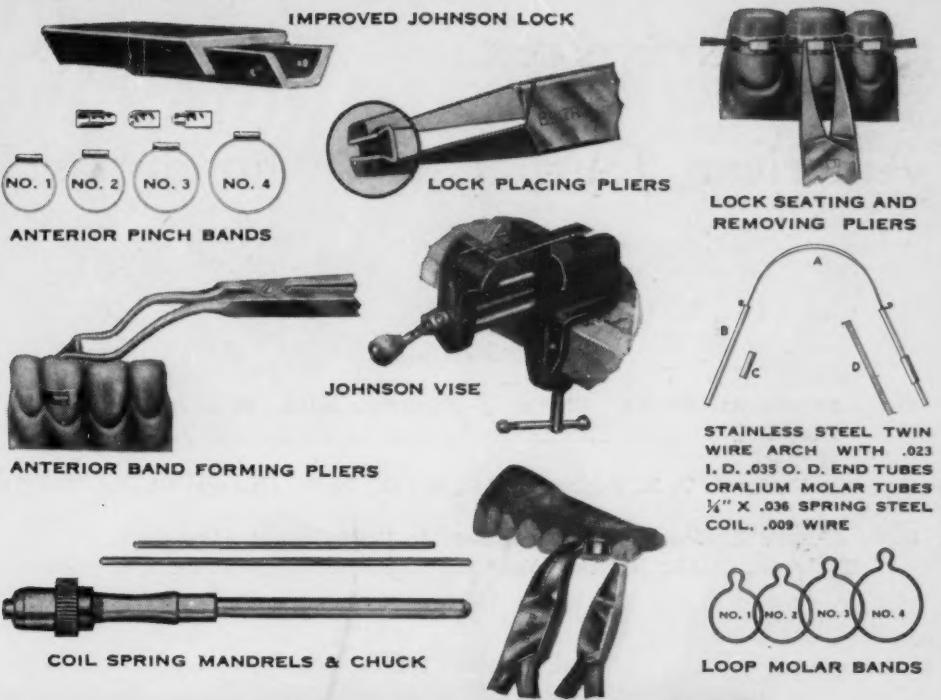
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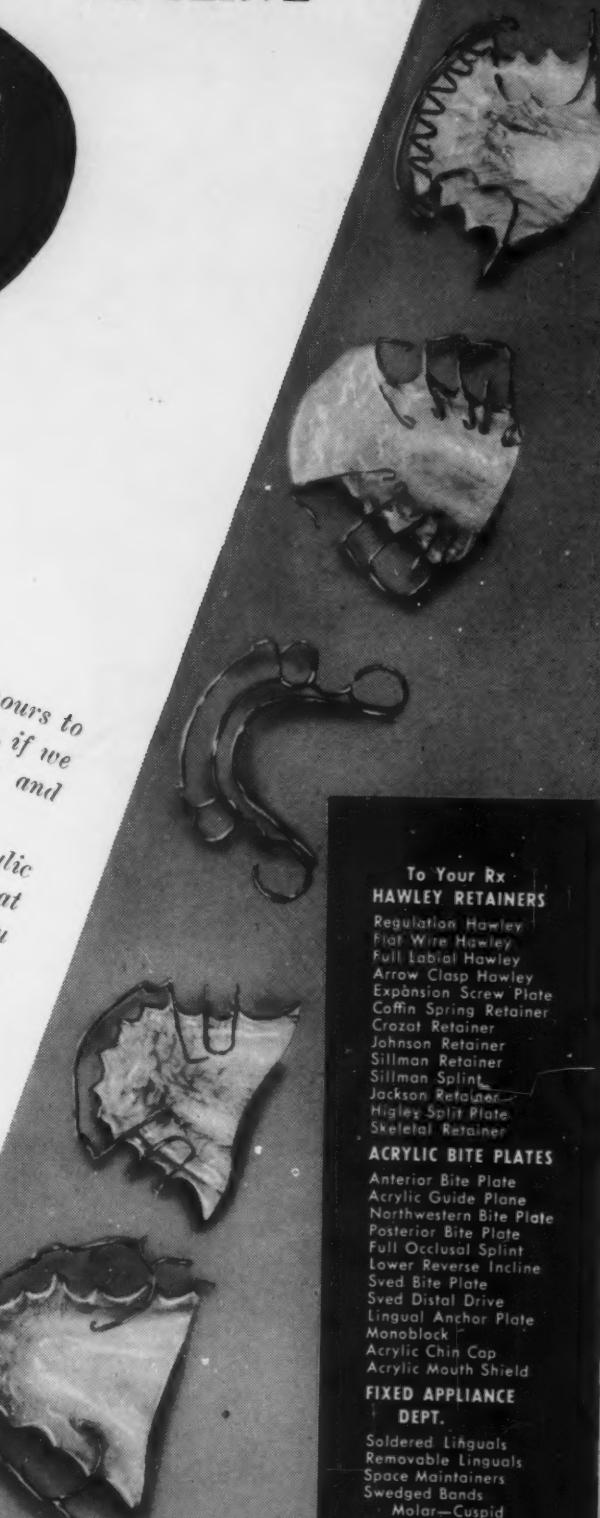
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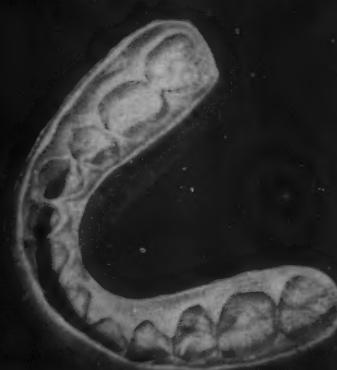
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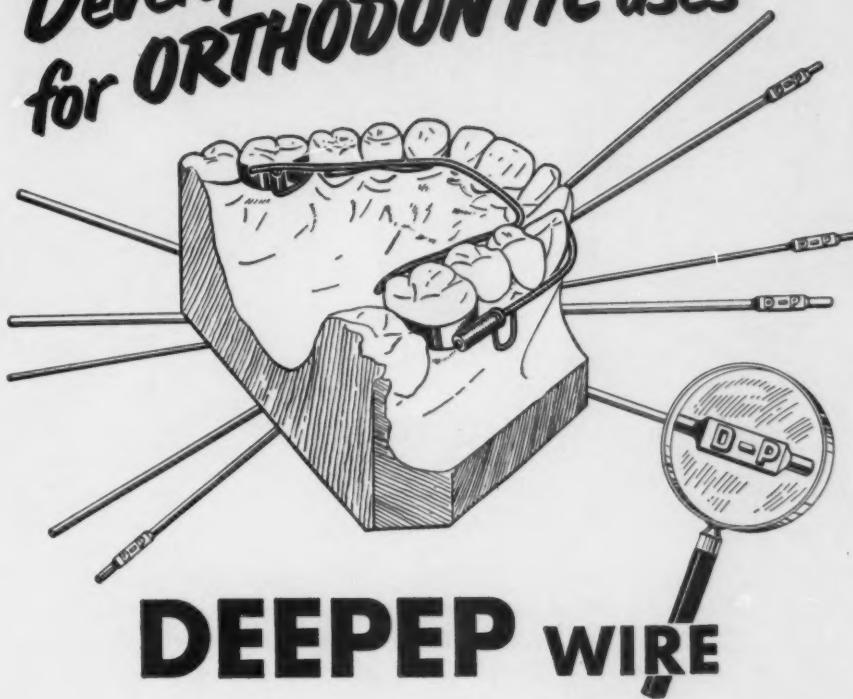
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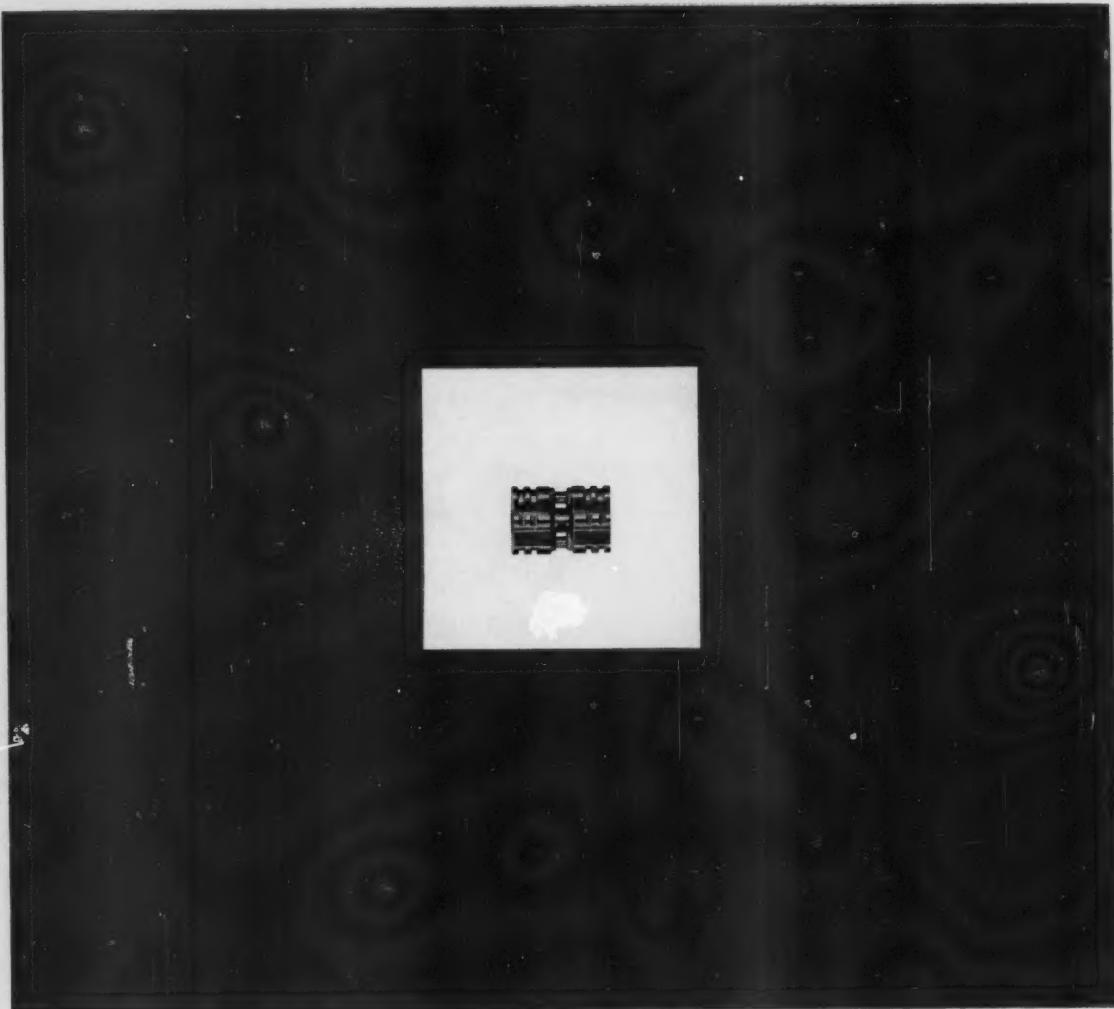


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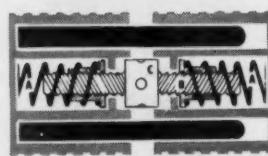
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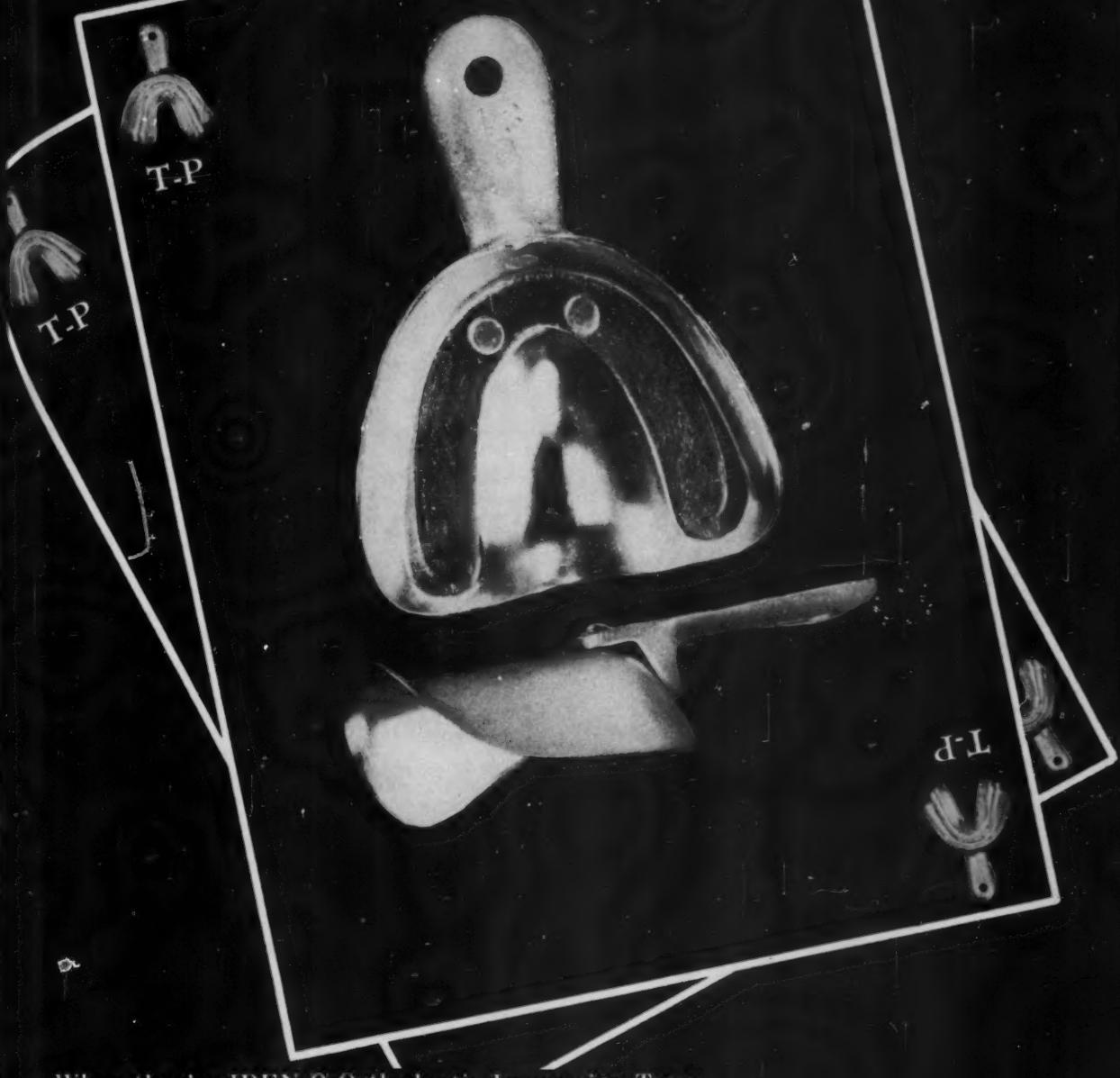
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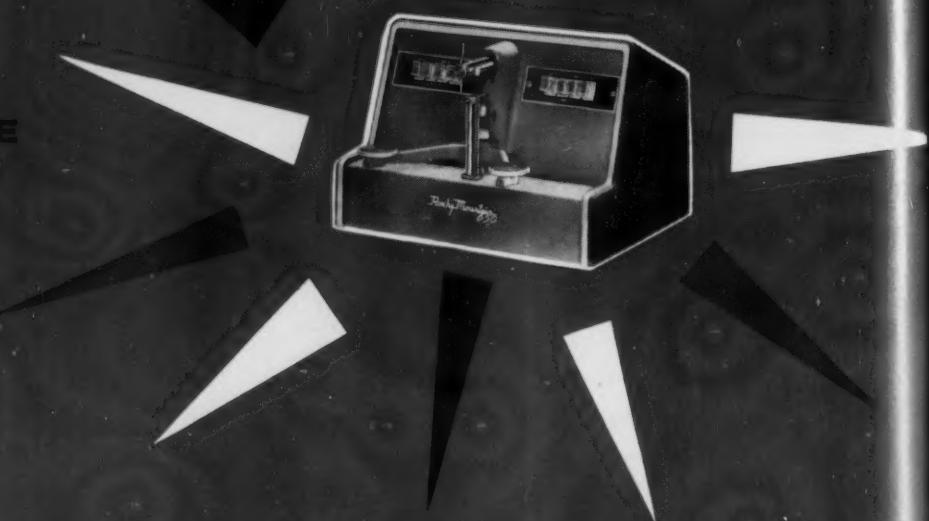
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VOL. 44

JANUARY, 1958

No. 1

Original Articles

THE INTEGUMENTAL PROFILE

CHARLES J. BURSTONE, D.D.S., M.S.,* INDIANAPOLIS, IND.

INTRODUCTION

IN MAN, the lower face serves not only in the interests of digestion, speech, and respiration, but it also influences to a large extent the social acceptance and psychological well-being of the individual. Appearance, therefore, is one of the primary functions of the face.

The teeth and the jaws form a dentoskeletal framework upon which lie muscle, connective tissue, and the integument. Orthodontic treatment by altering this dentoskeletal framework may produce desirable or undesirable alterations in the external or integumental contours of the face. The facial objective of the orthodontist might be considered the achievement of the optimal in facial harmony consistent with the maximum in functional occlusion within the limitations of therapy. The most desirable positions of the teeth and supporting structures for facial harmony cannot be determined from the denture alone, as considerable variation exists in the orientation of the teeth to the skull as a whole. Analysis of both dental and skeletal patterns alone may prove inadequate or misleading, for marked variation exists in the soft tissue covering the dentoskeletal framework. Even if an infinite number of points were used in the study of the dentoskeletal pattern, integumental contour could be predicted only if soft tissue formed a uniform veneer over teeth and bone. Fig. 1 demonstrates that variation, not uniformity, exists in the soft veneer. A group of mal-occlusions that exhibit striking dissimilarities in the soft-tissue architecture of

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Fig. 1.—Variations in soft-tissue architecture of the lips (A) and the chin (B).

the lips and the chin are shown. Because soft tissue may vary in different persons in thickness, length, and postural tone, it is necessary to study directly the integumental contour of the face in order to consider facial harmony adequately. Study of dentoskeletal components alone supplies only conjecture about integumental configurations. Anthropologists¹ have realized the futility of accurately predicting facial form from skeletal remains. Fortunately, the orthodontist does not have to predict; he can measure the integumental contour directly.

Facial form may be abstracted into two planes of space: (1) frontal and (2) sagittal. The midsagittal plane produces an outline which commonly is referred to as the profile. In this study, emphasis is placed on the integumental profile, not because the frontal plane is unimportant, but because many dentofacial malformations as well as therapy changes are more evident in this plane of space.

Relatively meager investigation of the soft-tissue profile is to be found reported in the orthodontic literature. Although almost every orthodontist has been aware of integumental changes occurring with treatment, there are perhaps two reasons for this omission. First, orthodontic treatment is primarily concerned with hard-tissue manipulations and, second, there has been an assumption which implies that, if the teeth are arranged according to a given standard, soft tissue will automatically drape in a maximally harmonious manner.

Simon² developed a method using the photograph, termed *photostatics*, which related the contour of the profile to the Frankfort horizontal and orbital planes. Four dentofacial zones, based on zones of movement, were described by Case.³ This approach was generally anthroposcopic, as opposed to anthropometric, and employed both clinical observation and the face mask. Hellman^{4, 5} utilized absolute measurement from the living and determined means and standard deviations of certain elements involved in facial height, width, and depth.

SCOPE OF STUDY

The present study is specifically concerned with the integumental profile. Four major problems are considered:

1. The development of a method of integumental profile measurement consistent with anthropometric standards.
2. The study of a group of good or acceptable young adult faces applying this method.
3. The exploration of this method of integumental profile analysis as an adjunct to treatment planning.
4. The application of this method in demonstrating soft-tissue changes incident to orthodontic treatment or plastic surgery.

CEPHALOMETRIC APPROACH

Orthodontic measurement of profile integumental contours must meet the strictest anthropometric standards. Two phases may be differentiated. The

first deals with procuring the cephalometric record and the second involves the actual procedure of measurement.

Advantages and Disadvantages of Cephalometric Approach.—Measurement may be taken directly from the living, but this has the disadvantage of diminished accuracy associated with soft-tissue flexibility. Time factors also prevail, since the operator cannot be as leisurely in this method and the patient cannot be expected to hold a given pose for a long period of time. Oriented photographs are another method of study in which accuracy is seriously damaged if the photograph is reduced in size or if midline structures are masked by more laterally lying ones.

The record used in this study is that of the oriented lateral headplate, employing the method and technique developed by Broadbent.⁶ Exposure is controlled to allow easy visualization of both hard- and soft-tissue contours. The oriented lateral headplate has certain advantages over other methods in measuring the integumental contour:

1. Headplates are approximately life size.
2. A given position need not be held for a long period of time by the patient, since only a few seconds are required for exposure.
3. Headplates contain other vital skeletal information, which many orthodontists employ. If a method of soft-tissue measurement is to have clinical application, no new records would be necessary other than the lateral headplates used for skeletal study and analysis.
4. The record is permanent. The measurements can be repeated by the investigator or by other investigators using the same or different measurements.
5. Midline structures can be differentiated from the more laterally lying contours.
6. Since both hard- and soft-tissue landmarks can be visualized, measurements relating them can be developed.
7. These records can be studied at the leisure of the investigator.

It is also necessary to be aware of certain inherent difficulties in oriented lateral headplates:

1. Radiographic images are not true, but show varying degrees of enlargement and distortion.⁷
2. Even if only the most easily visible landmarks are selected, occasions arise in which difficulty of visualization of landmarks is experienced.

Positioning the Subject.—Unless a standard method of subject positioning is observed, all future methods of measurement may well be meaningless. The patient is oriented with his sagittal plane at right angles to the path of the x-rays, and with Frankfort horizontal parallel to the floor. The mandible is

placed in centric occlusion, for increasing or decreasing vertical dimension would obviously have an influence on soft-tissue structures. The lips are lightly closed. They should not be overly relaxed or tightly closed. In certain extreme mal-occlusions, such as Class II, Division 1 cases, light lip closure does not allow the upper and lower lips to have complete contact. Admittedly, lip position is a variant that cannot be completely standardized. By observing precaution, however, the variation should be minimized for most practical purposes.

The procedure for positioning the subject is summarized as follows:

1. The sagittal plane is at right angles to the path of the x-rays.
2. The teeth are in centric occlusion.
3. The lips are lightly closed, neither overly relaxed nor tightly closed.

METHOD OF MEASUREMENT

Measurement consists of (1) establishing integumental landmarks, (2) forming line segments that represent components of the profile, and (3) relating these line segments to each other and to planes of the skull by angular readings.

Integumental Landmarks.—The key to a system of angular measurements is the formation of certain usable points or landmarks. All landmarks are midline structures. The integumental points or landmarks used in the study (Fig. 2) are:

1. *Frontal point (G).*—The most prominent point in the mid-sagittal plane of the forehead.
2. *Subnasale (A).*—The point at which the nasal septum between the nostrils merges with the upper cutaneous lip in the midsagittal plane.
3. *Superior labial sulcus (B).*—The point of greatest concavity in the midline of the upper lip between subnasale and labrale superius.
4. *Labrale superius (C).*—The median point in the upper margin of the upper membranous lip.
5. *Labrale inferius (D).*—The median point in the lower margin of the lower membranous lip.
6. *Inferior labial sulcus (E).*—The point of greatest concavity in the midline of the lower lip between labrale inferius and menton.
7. *Menton (F).*—The most prominent or anterior point on the chin, in the midsagittal plane.

For simplicity of measurement, capital alphabetical symbols, (*A*, *B*, *C*, *D*, *E*, *F*, and *G*) are used for each of the landmarks. It should be pointed out that these symbols are not names of landmarks, but rather represent the names listed above. They are employed to facilitate recording of angles, but should in no way replace the accepted terminology in the discussion of the points.

The accuracy of any method of measurement is partially determined by the accuracy of locating given landmarks by different observers. The preceding definitions are not sufficient to allow precision in spatial orientation of points.



Fig. 2.—Integumental landmarks. A, Subnasale; B, superior labial sulcus; C, labrale superius; D, labrale inferius; E, inferior labial sulcus; F, menton; G, frontal point.

The rules that are used in this study for localization of key landmarks are:

1. *Subnasale (A)*. The point where the maxillary lip and the nasal septum form a definite angle. If the depression is a gentle curve, subnasale is interpreted as the most concave point in this area as measured by a line angled 45 degrees from the nasal floor.
2. *Superior labial sulcus (B)*. The deepest point on the upper lip as determined by a line drawn from subnasale inclined so that it forms a tangent with labrale superius.
3. *Inferior labial sulcus (E)*. The most concave point as measured by a line tangent to menton and labrale inferius.
4. *Menton (F)*. The most anterior point of the chin, as measured by a perpendicular dropped from the nasal floor.

Profile Components (Line Segments).—Two landmarks determine a line segment, a linear representation of a given contour of the face. As the distance between landmarks approaches zero, a more accurate representation is created. If the number of line segments approaches infinity, it is possible to describe

completely the midline contour of the face. Practical limitation of the number of line segments used implies a partial description of the integumental profile. Each line segment represents the joining of two landmarks by a given operation. This may mean directly joining the two points, or it may imply tangents to areas bordering them. This operational approach, described under the definition of profile components, increases uniformity of measurement. Line

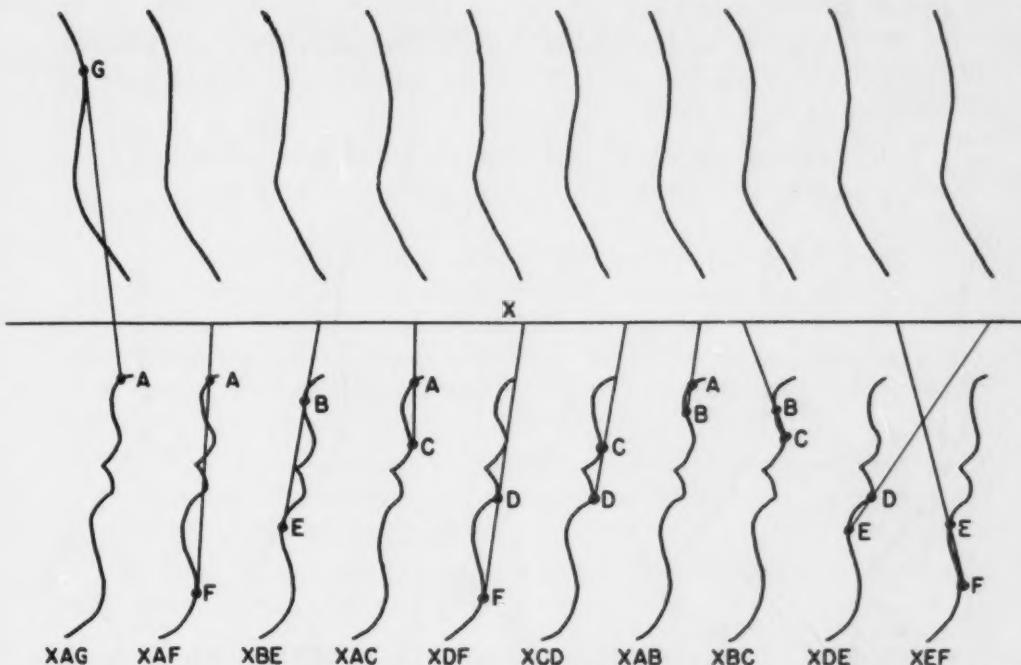


Fig. 3.—Profile components and inclination angles. Line connecting points forms profile component. Intersection of this line and nasal floor (*X*) forms inclination angle. *XAG*, Upper facial component; *XAF*, lower facial component, anterior; *XBE*, lower facial component, posterior; *XAC*, maxillary component; *XDF*, mandibular component; *XAB*, subnasal component; *XBC*, superior labial component; *XCD*, interlabial component; *XDE*, inferior labial component, *XEF*, supramental component.

segments, by denoting given parts of the profile of varying size, are termed profile components and carry the name of the region of the face that they describe. They are defined as follows (Fig. 3):

1. *Upper facial component*, frontal point-subnasale (*AG*). A line passing through subnasale and tangent to frontal point.
2. *Lower facial component* (anterior), subnasale-menton (*AF*). A line passing through subnasale and tangent to menton.
3. *Lower facial component* (posterior), superior labial sulcus-inferior labial sulcus (*BE*). A line tangent to superior labial sulcus and inferior labial sulcus.
4. *Maxillary component*, subnasale-labrale superius (*AC*). A line passing through subnasale and tangent to labrale superius.
5. *Mandibular component*, labrale inferius-menton (*DF*). A line tangent to labrale inferius and menton.

6. Interlabial component, labrale superius-labrale inferius (CD).

A line tangent to labrale superius and labrale inferius.

7. Subnasal component, subnasale-superior labial sulcus (AB). A line connecting subnasale and superior labial sulcus.

8. Superior labial component, superior labial sulcus-labrale superius (BC). A line passing through the superior labial sulcus tangent to labrale superius.

9. Inferior labial component, labrale inferius-inferior labial sulcus (DE). A line passing through inferior labial sulcus and tangent to labrale inferius.

10. Supramental component, inferior labial sulcus-menton (EF). A line passing through inferior labial sulcus and menton.

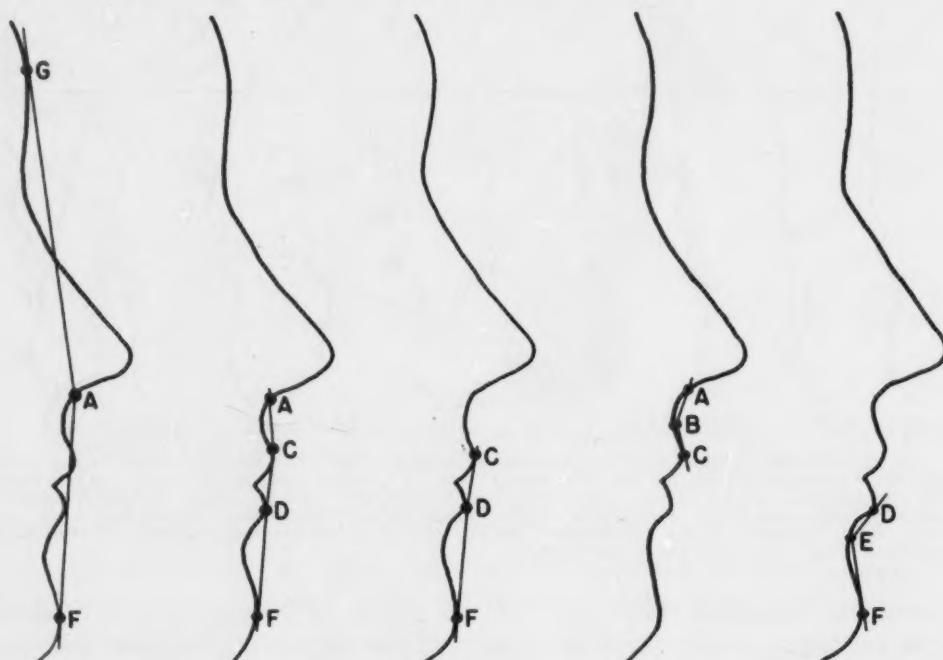


Fig. 4.—Contour angles. *GAF*, Total face contour; *CDF*, labiomandibular contour; *ACDF*, maxillomandibular contour; *ABC*, maxillary sulcus contour; *DEF*, mandibular sulcus contour.

Contour Angles.—As the lines that represent various profile components intersect, contour angles are formed which abstract the intricate morphology of the integumental profile. Although with the ten given components, theoretically forty-five distinct angles are possible, only five will receive special attention in this study (Fig. 4):

Total facial contour (GAF). Angle formed by the intersection of upper facial and anterior lower facial components.

Maxillomandibular contour (ACDF). Angle formed by the intersection of maxillary and mandibular components.

Labiomandibular contour (CDF). Angle formed by the intersection of interlabial and mandibular components.

Maxillary sulcus contour (ABC). Angle formed by intersection of subnasal and superior labial components.

Mandibular sulcus contour (DEF). Angle formed by the intersection of inferior labial and supramental components.

Inclination Angles.—The study of facial balance implies not only the relationship of profile components to each other, but also the relationship of profile components to the skull as a whole. The orientation of profile components to the skull is measured by inclination angles, the intersection of any line segment with nasal floor. Nasal floor is selected as the plane of reference for the following reasons:

1. Nasal floor approaches a horizontal position in erect posture and thereby aids the visualization of profile components in space. (It should be added that no plane consistently parallels the horizontal in erect posture, since posture is a function not of skeletal landmarks, but of a complex neuromuscular system determining the position of the head.)
2. Nasal floor is a guide to the orientation of the maxilla, the most important stable bone supporting the dental apparatus and the most important bone forming the face.
3. Nasal floor is readily established by a line connecting two bony landmarks, the anterior and posterior nasal spines.

Nasal floor is a reliable guide to the orientation of the skull as a whole only if it is typically positioned in relation to the other structures of the skull.

This reliability may be estimated by measuring the average divergence between nasal floor (NF) and other planes of the skull. If Frankfort horizontal (FH) and sella-nasion (SN) are employed, NF is related, collectively, to structures in the sphenoid, frontal, nasal, maxillary, and temporal bones. Even though, theoretically, an infinite number of cranial planes would be required, this study utilizes, for reasons of practicality, only two, FH and SN.

The mean divergence of FH and SN from NF could be visualized as an imaginary plane, and hence is termed the mean divergent plane (MDP). MDP is specifically calculated by adding the amount of opening or closing of Frankfort horizontal and sella-nasion from nasal floor and dividing by two. Opening with the angular apex aimed posteriorly gives a positive reading, and closing with the angular apex facing anteriorly gives a negative reading. When Björk's⁸ general population statistics are used, the MDP can be calculated and would be approximately 6 degrees (for 12-year-old boys and adults). Nasal floor, then, can be said to be typically positioned in the skull if the mean divergent plane opens about 6 degrees. Unless nasal floor is typically positioned, it cannot be considered as a guide to the orientation of the skull as a whole. If it or any other plane is used without proper correction, a given reading measures not only variation in the profile component to be studied, but also variation in

the plane of reference. In cases where MDP does not open 6 degrees from NF, it is necessary to correct angular readings by shifts in a positive or negative direction. The amount of correction is calculated by subtracting 6 degrees (average mean divergent plane) from the observed reading of a given case. Two examples will further clarify this. Suppose that lower facial inclination (intersection of lower facial component and nasal floor) is measured and found to be 10 degrees. In order to answer the question of whether this represents the inclination of the maxillary component to the skull as a whole or merely to an atypically positioned nasal floor, mean divergent plane (MDP) is calculated. If FH opens 10 degrees (+10) and SN opens 12 degrees (+12), then:

$$\begin{array}{r} \text{FH + SN} = 10 + 12 = 22 \\ \text{FH + SN} = \frac{22}{2} = 11 \\ \text{MDP} - \overline{\text{MDP}} = 11 - 6 = +5 \end{array}$$

Nasal floor is atypically positioned, and hence a calculated positive shift of 5 degrees is necessary. Adding 5 degrees to the original 10-degree reading, it is found that 15 degrees more closely represents the inclination of the lower face to the skull as a whole. If, on the other hand, FH closes 1 degree (-1) and SN closes 5 degrees (-5), then:

$$\begin{array}{r} \text{FH + SN} = (-1) + (-5) = -6 \\ \text{FH + SN} = \frac{-6}{2} = -3 \\ \text{MDP} - \overline{\text{MDP}} = -3 - 6 = -9 \end{array}$$

In this case by adding -9 to the original 10-degree reading, it is found that 1 degree more closely approximates the relationship of the lower face to the skull as a whole. This correction is a negative shift. Positive (retrognathic) and negative (prognathic) shifts are subsequently discussed. Unless these shifts are taken into consideration, there is a dangerous risk of being informed not of variation in structures under study, but of variation in the plane of orientation.

The inclination angles are measured to nasal floor and carry the name of the facial component. Nasal floor (NF), for the sake of brevity, carries the symbol X (Fig. 3).

Angular Measurement.—All measurements are made in degrees. A perpendicular from nasal floor is the zero reading. Inclination angles are so measured (Fig. 5) that rotation of a line segment to NF in a clockwise direction from this perpendicular produces a positive (+) reading and a counterclockwise rotation produces a negative (-) reading. Therefore, given the number of degrees and its sign, a line segment (profile component) is definitely oriented to nasal floor.

Contour angles are measured from a straight line (180 degrees) interpreted as a 0-degree reading. They can be measured directly or, for convenience, calculated from inclination angles by subtraction. In order to maintain consistency

in sign, the following rules for calculating contour angles are given. All contour angles are formed by subtracting the two inclination angles whose line segments form the contour angle.

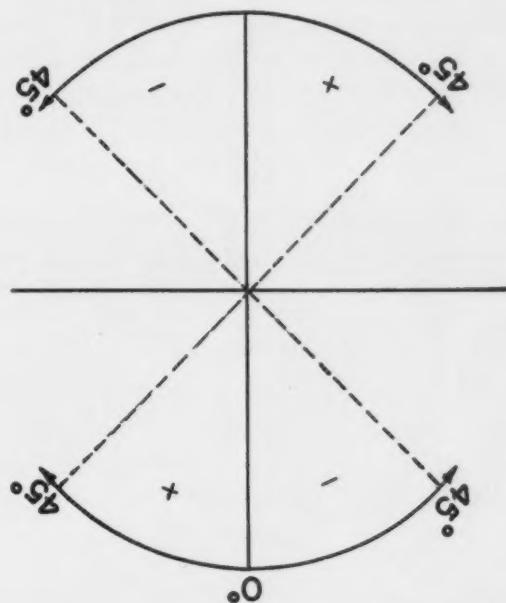


Fig. 5.—Angular measurement. All measurements are made in degrees. A perpendicular from nasal floor is the zero reading. Inclination angles are so measured that rotation of a line segment to NF in a clockwise direction from the perpendicular produces a positive (+) reading and counterclockwise rotation a negative (-) reading.

1. If the two angles of inclination are angles that normally (according to the Herron sample) are plus and minus, the value that corresponds to the minus quantity changes sign and the two quantities are added. (This, of course, is subtraction.)
2. If two angles of inclination are normally both plus or both minus, the sign is changed on the one that is lowest in the listed order and then both quantities are added.

This information is given in Table I.

TABLE I. NORMAL PLUS OR MINUS VALUES OF INCLINATION ANGLES (ACCORDING TO HERRON SAMPLE)

SIGN	ANGLE
-	XAG Upper facial inclination
+	XAF Lower facial inclination (anterior)
+	XBE Lower facial inclination (posterior)
-	XAC Maxillary inclination
+	XDF Mandibular inclination
+	XCD Interlabial inclination
+	XAB Subnasal inclination
-	XBC Superior labial inclination
+	XDE Inferior labial inclination
-	XEF Supramental inclination

TABLE II. RELATION OF DESCRIPTIVE TERMS TO POSITIVE AND NEGATIVE DEVIATIONS OF INTEGUMENTAL PROFILE ANGLES

NEGATIVE	INCLINATION ANGLES	POSITIVE
Retruson	XAG	Protrusion
Prognathism	XAF	Retrognathism
Prognathism	XBE	Retrognathism
Protrusion	XAC	Retruson
Protrusion	XDF	Retruson
Protrusion	XCD	Retruson
Protrusion	XAB	Retruson
Protrusion	XBC	Retruson
Retruson	XDE	Protrusion
Protrusion	XEF	Retruson
NEGATIVE	CONTOUR ANGLES	POSITIVE
Concavity	GAF	Convexity
Concavity	ACDF	Convexity
Concavity	CDF	Convexity
Straight	ABC	Concavity
Straight	DEF	Concavity

Negative and positive deviations of angles from 0 degrees or normal are described by the terms protrusion, retruson, retrognathism, prognathism, concavity, and convexity. The relationship between these terms and positive and negative deviations is shown in Table II.

HERRON SAMPLE

The sample consists of a group of forty acceptable faces as chosen by a group of three artists at the Herron Institute of Art in Indianapolis. The artists selected this group from over 100 persons. The persons were those who possessed good or excellent faces as chosen from frontal and lateral photographs. Particular attention was centered on the profile in the selection. Since debate is inevitable in gauging how good or excellent these faces might be, they are minimally interpreted as being acceptable (Fig. 6). By having a sample of acceptable faces chosen by a group of artists, orthodontic prejudices on this subject are eliminated. The only limitations in selection of this sample were age (young adults) and race (Caucasian).

TABLE III. CHARACTERISTICS OF HERRON SAMPLE

<i>Age (years):</i>		<i>Sex:</i>	
Mean	23.8	Males	15
Standard deviation	5.01	Females	25
		Total number	40
Range:	16.5 to 36.3	<i>Profiles:</i>	Acceptable or better, as determined by a panel of artists
<i>Race:</i>	Caucasian		

Central Tendency and Dispersion of Acceptable Adult Faces (Herron Sample).—The average inclinations and contours formed by the profile components and their estimated variation from the mean are found in Table IV.

It can be seen that the average profile has an upper and a lower face that retrudes from subnasale. Maxillary, upper facial, and superior labial inclinations are increasingly negative as lower facial, mandibular, and interlabial inclinations are increasingly positive.

The curve of the lower lip (inferior labial component) approaches a 45-degree slope from nasal floor. The subnasal component retrudes from subnasale the same number of degrees that the supramental component protrudes from inferior labial sulcus (16.1 degrees).

Total facial contour (GAF) is slightly convex (11.3 degrees) and maxillo-mandibular contour has approximately the same value as it describes the contour of the lower face (11.5 degrees). Labiomandibular contour approaches a straight line (-0.5 degree). The mandibular sulcus is more concave than the maxillary sulcus by 14.9 degrees.



Fig. 6.—Typical profiles from Herron sample.

The variation around a mean is estimated by the use of the standard deviation whose values for inclinations and contour angles are listed in Table IV. Smallest variation is shown in upper facial, lower facial (anterior and posterior), and supramental inclinations, whereas greatest variation is seen in superior and

inferior labial inclinations. Among the contour angles minimal variation is present in total facial contour and maximal in both maxillary and mandibular sulcus angles. No significant difference is found between males and females in either inclination or contour angles in this sample.

TABLE IV. INTEGUMENTAL ANGULAR MEANS, STANDARD DEVIATIONS, RANGES, AND STANDARD ERRORS OF MEAN OF ACCEPTABLE YOUNG ADULT PROFILES (HERRON SAMPLE)

MEAN (DEGREES)	STANDARD DEVIATION (DEGREES)	RANGE (DEGREES)	STANDARD ERROR OF MEAN	ANGLE
-6.5	3.2	-13.5 - 0.5	0.50	Upper facial inclination (XAG)
4.8	4.0	-11.5 - 1.5	0.64	Lower facial inclination (XAF)
11.7	4.2	-19.5 - 5.5	0.67	Lower facial inclination (XBE)
-4.0	6.7	-19.0 - 9.0	1.07	Maxillary inclination (XAC)
7.5	5.5	-17.5 - 3.5	0.89	Mandibular inclination (XDF)
8.0	5.0	-16.5 - 5.5	0.80	Interlabial inclination (XCD)
16.1	7.4	-35.0 - 1.0	1.19	Subnasal inclination (XAB)
-27.0	9.5	-45.5 - 6.5	1.50	Superior labial inclination (XBC)
41.9	9.2	-67.0 -21.0	1.47	Inferior labial inclination (XDE)
-16.1	3.7	-24.5 - 7.5	0.59	Supramental inclination (XEF)
11.3	4.1	-24.5 - 0.5	0.65	Total facial contour (GAF)
11.5	6.5	-23.0 - 9.0	1.04	Maxillomandibular contour (ACDF)
-0.5	6.0	-11.5 -15.5	0.96	Labiomandibular contour (CDF)
43.1	10.0	-19.5 -65.0	1.56	Maxillary sulcus contour (ABC)
58.0	11.7	-41.0 -82.0	1.83	Mandibular sulcus contour (DEF)

MEAN, VARIATION, PROFILE HARMONY, AND DEFORMITY

The orthodontist, in his desire to effect optimal profile changes, may wonder if general descriptive or statistical methods can supply any guide to the achievement of this objective. The hypothesis is now explored that as profile inclinations, contours, and proportions approach the average (for any given racial or ethnic group) they become more harmonious, and as they vary from this average disharmony or deformity results.

Many great artists have believed that the average, perhaps only partially, may serve as a guide to excellence of facial form. Albert Dürer stated that if one is to represent beauty, he should note deformity and teach himself to avoid it.⁹ Leonardo da Vinci, employing this negative approach, reported that if he saw an uncommon face he would carefully study and draw it. Sir Joshua Reynolds preached that beauty is "the medium or center of various forms of individuals within every phase of animal life." This, of course, closely approximates the statistic known as the mean.

Common expression, likewise, suggests that deformity is variation from the mean. A "big nose" implies a nose larger than average, "thick lips" means lips thicker than average, and "prominent chin" describes a chin "sticking out" more than average.

It appears that those inclinations, contours, and proportions that are most commonly seen are identified as esthetically the most harmonious and, on the other hand, those components that are atypical or different are construed as deformity. The notion of "the average profile" differs from person to person and from one racial or ethnic group to another; to some degree, it changes during different eras, depending upon the visual experience of individuals or groups. The average face to the native of African Sudan is far different from the typical face to a New York urbanite. The average profile, therefore, must be considered a variant depending upon individual, ethnic or racial, and temporal factors.

Twentieth century mass media (television, movies, advertising, etc.) have presented to the public faces that are generally thought of as "good-looking" or beautiful. The impact of these media has been so widespread that individuals of varying ethnic and racial groups who ordinarily would be expected to develop their own concepts of facial harmony accept the "Hollywood standard" of facial excellence. The mean values of the Herron sample, either because the artists are part of this culture or because the sample reflects the mean of the population as a whole, simulate the "Hollywood type."

Probably no person has profile components that are on the mean of this or any other study, since variation from the average to some extent can be found in faces that are generally thought of as esthetically harmonious. The amount of variation possible without destruction of profile esthetics has no definitive answer, for it depends upon the critical nature of the observer. For instance, an artist, well cognizant of facial contours, might allow less variation than a lay person. In any event, the harmonious profile is not only the average arrangement of the facial components, but reasonable variation is allowed around it, the amount of acceptable variation depending on the observer. Excellent faces, therefore, are not all identical even if it is assumed that their component parts border on the mean.

The Herron sample may be interpreted to include profiles that are acceptable to excellent. As previously mentioned, minimal interpretation of acceptable profile is used. The range of values (Table IV) implies the limits of contour and inclination angles that were considered acceptable ($2 \times \sigma$ approximately estimates the limits of all values except 5 per cent of the acceptable profile population). If the various angles are to be considered individually, these limits can be deceiving, since moderate deformity in a given component may be masked by a generally harmonious profile. For this reason, normal readings for each angle are limited to the middle 68 per cent of the values. This is only an arbitrary figure selected purely for convenience because it represents the mean plus or minus one standard deviation and simplifies comparison of

INTEGUMENTAL PROFILE GRID OF ACCEPTABLE YOUNG ADULT FACES

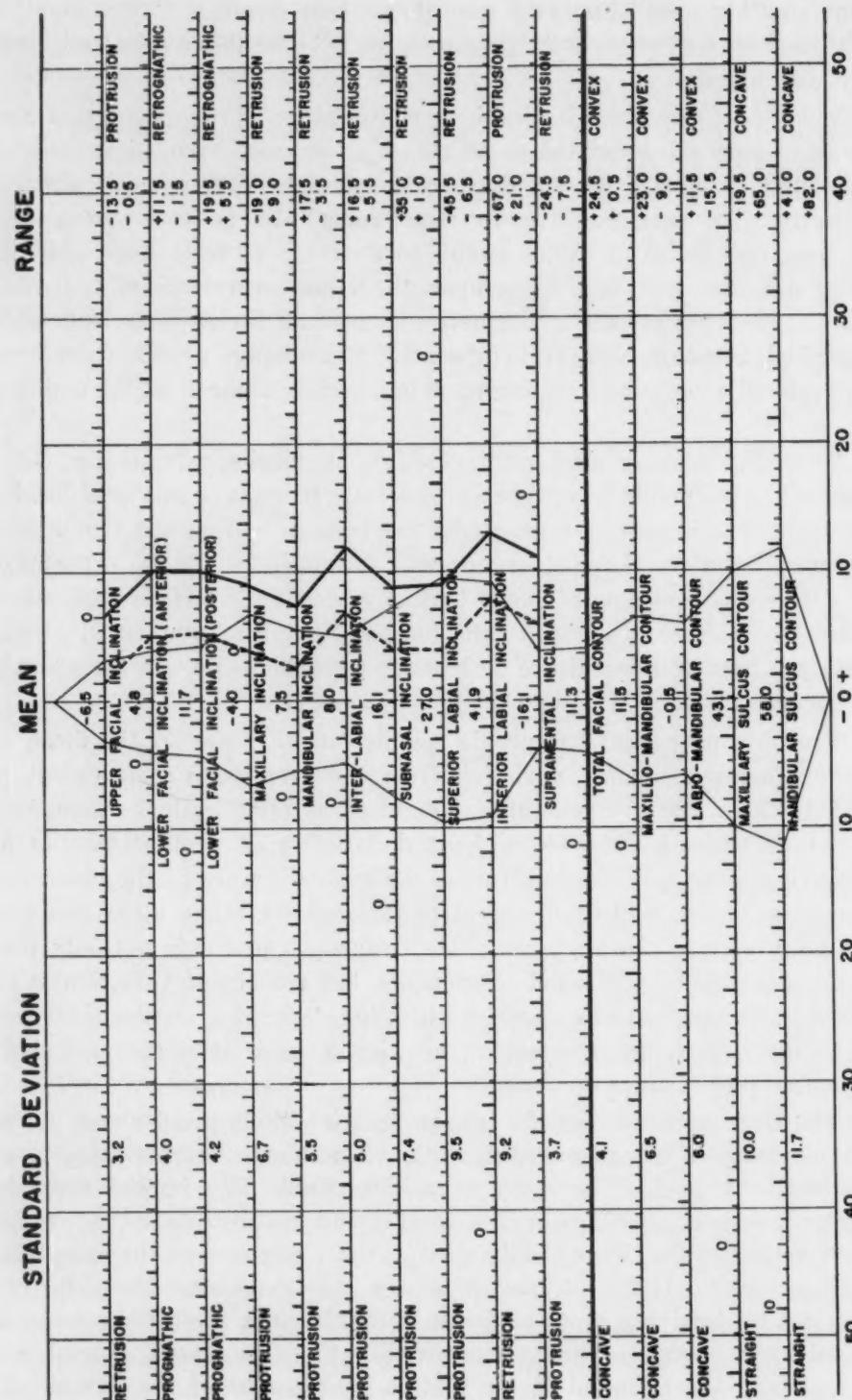


Fig. 7.—Integumental profile grid. Negative shift of nasal floor of -5.0 degrees. The observed reading is represented by a solid line and the shifted value by a dotted line.

variation among contour and inclination angles. However, the allowable limits of variation around the mean can be determined in any way the student of the profile sees fit, depending upon his desire to admit large or small variation possibilities in acceptable profiles. Normal profile components are defined as those which form angles that do not vary more than one standard deviation on either side of the mean (which, as a definition of convenience, should not be interpreted too literally.)

An integumental analysis of this type might be misleading if the following factors are not considered:

1. The given angular readings are but partial abstractions and do not describe all possible relationships. (This analysis does not include such factors as the nose or proportions.) No analysis, no matter how complete, includes *all* relationships.
2. The mean and standard deviation represent the bias of the group that selected the sample (supposedly the bias of the public as a whole). The parent or patient could have a different concept of facial balance.
3. Appearance is not only a function of morphology, but may be influenced to strong degrees by those subtle factors of personality.

GRAPHIC REPRESENTATION—THE INTEGUMENTAL PROFILE GRID

In order to facilitate comparison of individual case values with those of acceptable faces, a graphic method, the integumental profile grid, is presented.

The profile grid (Fig. 7) has a vertical line down the center with mean values for each angle on it. To the right and left, connected lines forming a wiggle extend one standard deviation on either side of the mean. The various inclinations and contour angles are identified by the labeling below the horizontal lines. A heavy line separates inclination and contour angles. Values for standard deviation and range are given in columns, respectively, at the left and right of the grid. Markings at the bottom of the graph designate deviations from the mean by units of 10 degrees. (Positive variation is to the right and negative variation is to the left.) Every line presents its own scale for recording angular readings, the markings being in multiples of 5 and 10. Negative numbers are placed to the left of the zero point and positive numbers are placed to the right. Descriptive terms for each angle, describing the nature of variation from the mean, are found on the extreme right and left below the line.

The grid is arranged so that if nasal floor is atypically positioned relative to the skull as a whole (as estimated by the mean divergent plane), inclination angles can be corrected by shifting uniformly all readings to the right (positive shift) or to the left (negative shift) the appropriate number of degrees for a given case. If, for instance, mean divergent plane varies -5 degrees from the MDP average, a negative shift of 5 degrees (dotted line) more closely represents the relation of these profile components to the skull as a whole and the mean for acceptable faces (Fig. 7).

INTEGUMENTAL PROFILE GRID OF ACCEPTABLE YOUNG ADULT FACES

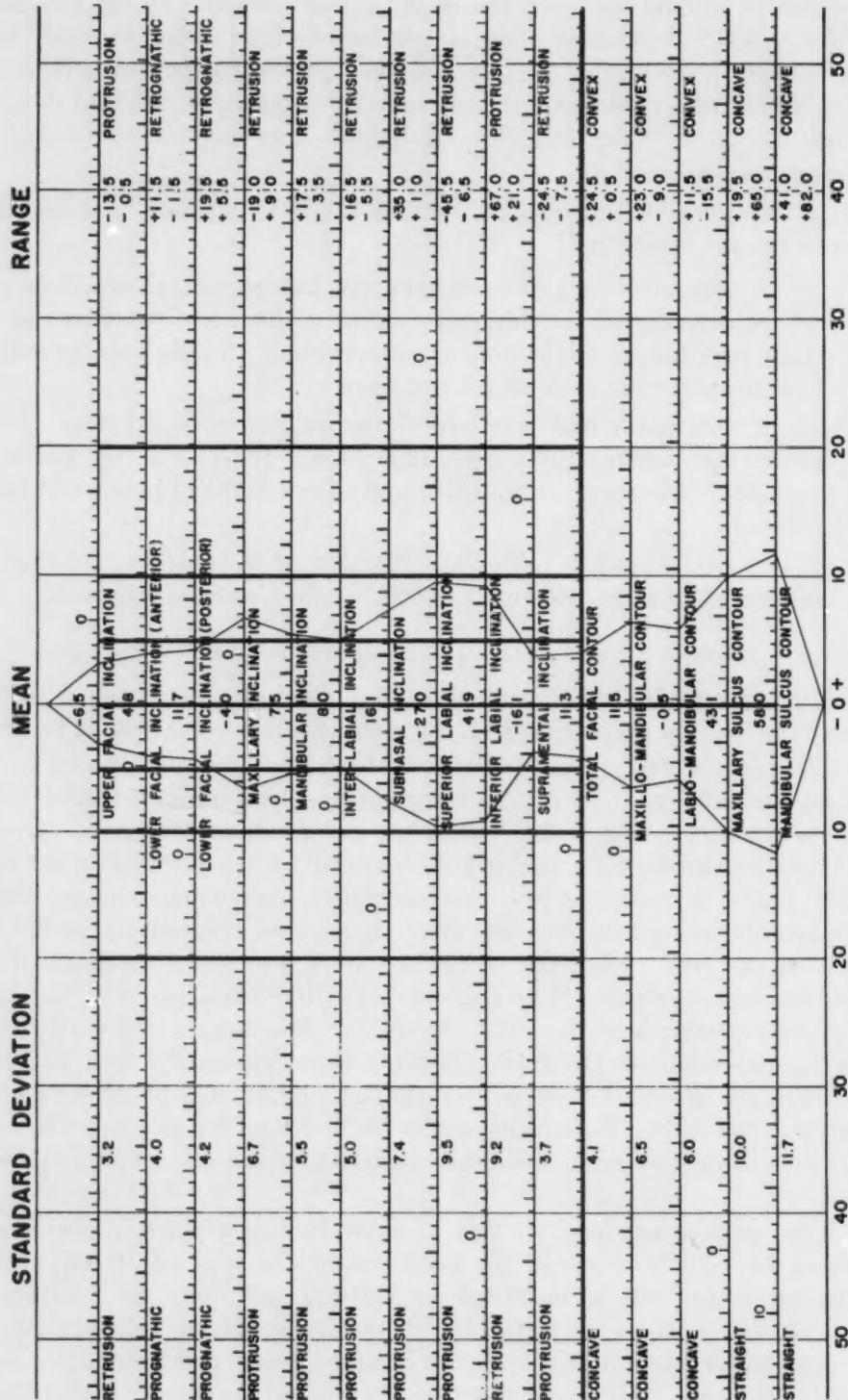


Fig. 8.—Integumental profile grid demonstrating vertical parallelism.

If all inclination angles fall down the center line or mean, an average profile contour is present. Likewise, any straight vertical line, no matter how distant from the mean, produces average contour; only the inclination of these components to the skull as a whole is altered as the vertical lines deviate from the mean (Fig. 8). This is based on the fact that variation from the mean, if it is uniform, can still maintain an average profile contour.

Normal profile components, by definition, are those that are plotted within the wiggle (one standard deviation).

INTEGUMENTAL PROFILE ANALYSIS

Application to Treatment Planning.—Malocclusions possess profile disharmony of varying amounts. The aim of the orthodontist is to minimize this

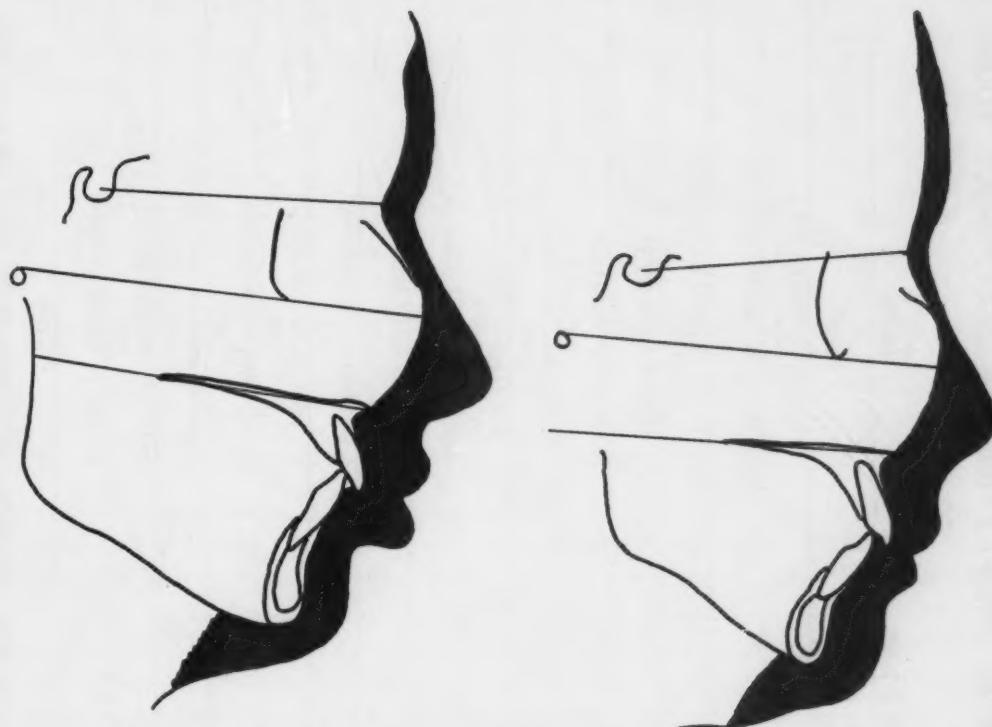


Fig. 9.—Comparison of two Class II, Division 1 cases having similar dentoskeletal patterns but different integumental contours. Right, Patient B. V.; left, Patient J. C.

disharmony during therapy. Since the objective is to produce a facially acceptable or excellent young adult, some of the factors that can influence this are presented below in the following verbal formula:

$$\text{Malocclusion face} + \text{Normal growth} + \text{Orthodontic therapy} \longrightarrow \text{Post-treatment face.}$$

In comparing an adolescent to the norm of young adults, the possible effect of growth on both hard and soft tissue, as well as the potential orthodontic effects has to be considered. The use of rest position headplates with the lips

INTEGUMENTAL PROFILE GRID OF ACCEPTABLE YOUNG ADULT FACES

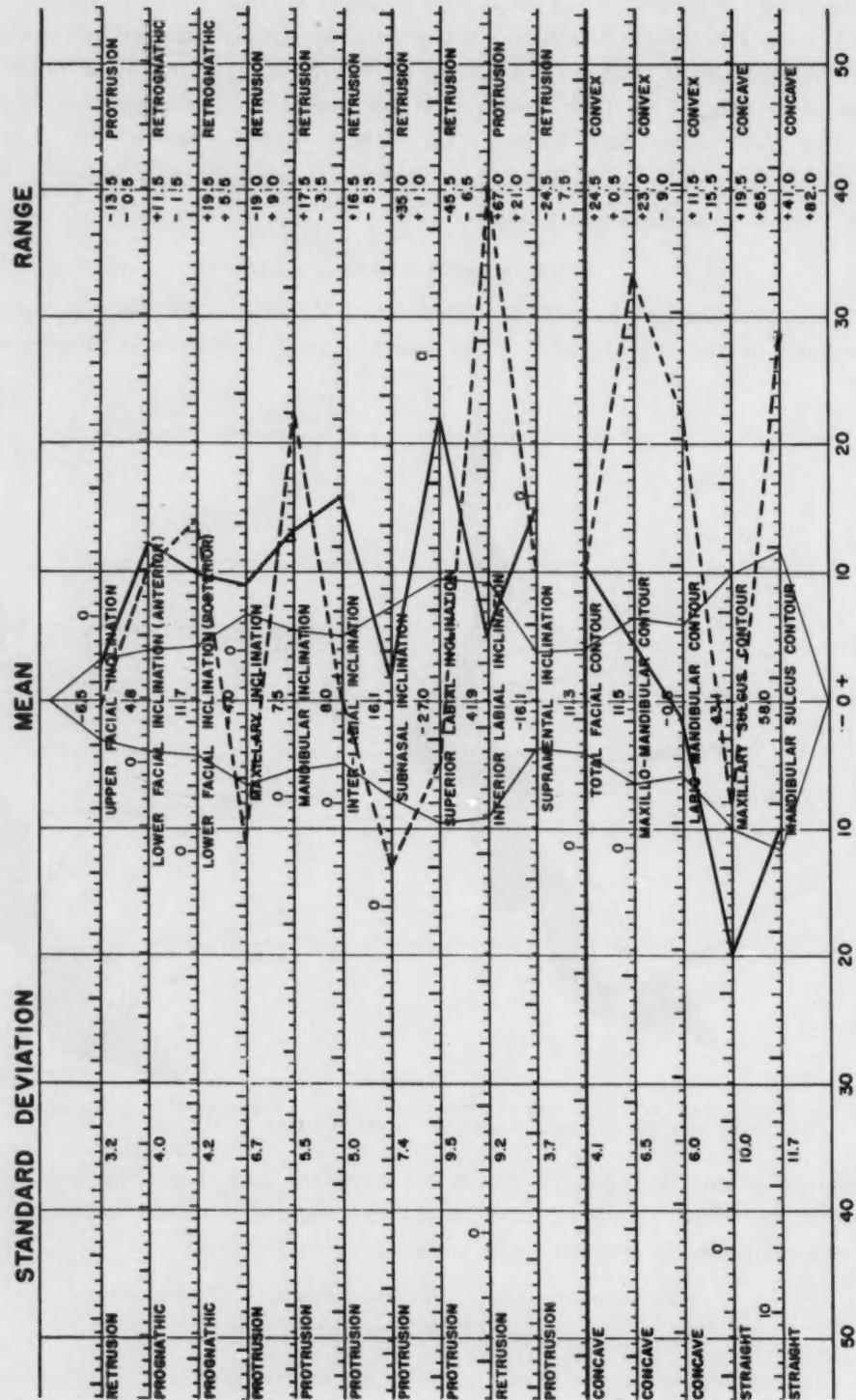


Fig. 10.—Integumental profile grid. Comparison of Patients B. V. (solid line) and J. C. (dotted line) shown in Fig. 8.

slightly open is extremely helpful in predicting possible postural changes incident to altered dentoskeletal configurations. The most common example of this is disturbed mentalis action in cases with marked overjet.

Two Class II, Division 1 cases will demonstrate the application of the integumental profile grid to case analysis (Fig. 9).

Patients B. V. and J. C. have similar dentoskeletal patterns but sharply differing integumental contours (Table V). The mean divergent plane for Patient B. V. is 4.5 degrees and for Patient J. C. it is 3.0 degrees, which suggests negative shifts of -1.5 degrees and -3.0 degrees respectively, a process which more closely orients the profile inclinations to the skull as a whole.

TABLE V. COMPARISON OF TWO CLASS II, DIVISION 1 CASES (INTEGUMENTAL PROFILE) FROM FIG. 9

ANGLE	PATIENT B. V. (DEGREES)	PATIENT J. C. (DEGREES)
XAG	-4.0	-7.0
XAF	18.0	15.0
XBE	22.0	26.0
XAC	5.0	-15.0
XDG	21.0	30.0
XCD	24.0	8.0
XAB	18.5	3.0
XBC	-5.0	-32.0
XDE	47.0	82.0
XEF	-1.0	-5.0
GAF	22.0	22.0
ACDF	16.0	45.0
CDF	-3.0	22.0
ABC	23.0	35.0
DEF	48.0	87.0
MDP	4.5	3.0
MDP - MDP	-1.5	-3.0

Considering inclination angles, Patient B. V. (solid line) more generally approaches a straight line (average contour) than Patient J. C. (dotted line), whose line crosses from one side of the mean to the other in jagged fashion (Fig. 10). Patient B. V. maintains acceptable contour angles (with the exception of total facial contour and maxillary sulcus contour), even though many of the profile components are atypically placed relative to the skull. Patient J. C., on the other hand, presents a convex lower face (maxillomandibular and labiomandibular angles).

A striking difference is seen in the inclination of the maxillary component which is retrusive in Patient B. V. and protrusive in Patient J. C.

Because of its wide scope, integumental profile analysis of malocclusions and its application to treatment planning will be considered in detail in a subsequent publication. However, it might be superficially stated that Patient J. C. requires greater dental retrusion during treatment. These esthetic conclusions must be coordinated with other orthodontic objectives (occlusal excellence, stability, etc.) in arriving at the final treatment plan.

Application to the Study of Treatment Results.—The integumental profile grid can serve as a guide in the evaluation of treatment results. Figs. 11, 12,



Fig. 11.—Photographs showing pre- and posttreatment profile of Class II, Division 1 case.
A, Pretreatment; *B*, posttreatment.

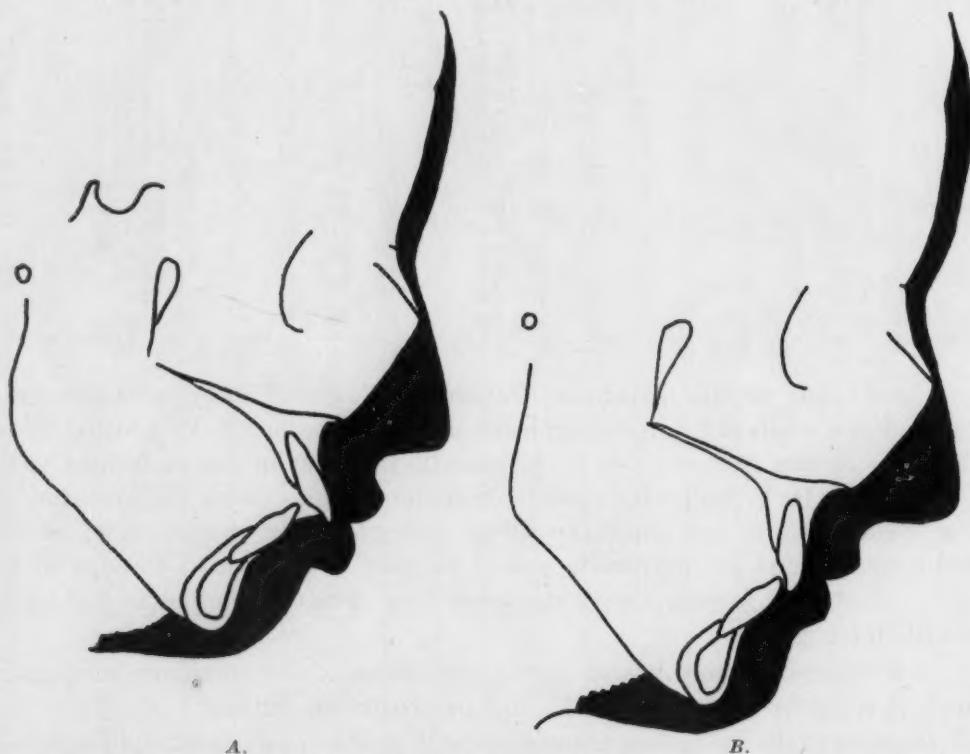


Fig. 12.—Tracings showing pre- and posttreatment profile of Class II, Division 1 case in Fig. 11. *A*, Pretreatment; *B*, posttreatment.

and 13 show a Class II, Division 1 case before and after treatment and demonstrate some of the integumental changes occurring during treatment (Table VI).

The plotted inclination angles before treatment (solid line) form a jagged line deviating from both sides of the mean. This irregular line is an indication of contour disharmony. Following treatment this line (dotted) more closely

INTEGUMENTAL PROFILE GRID OF ACCEPTABLE YOUNG ADULT FACES

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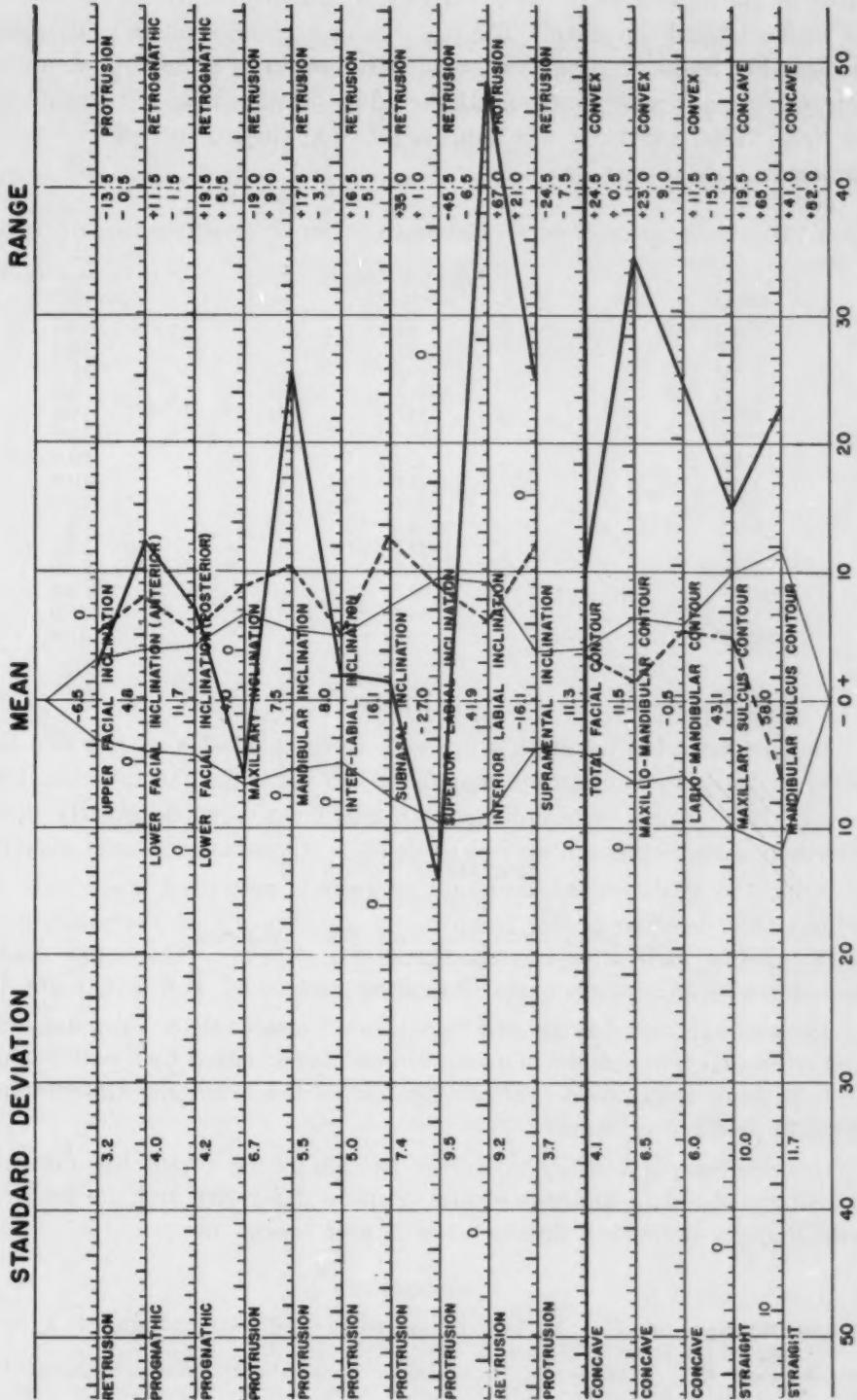


Fig. 13.—Integumental profile grid of case shown in Figs. 11 and 12. Solid line represents profile before treatment; broken line represents profile after treatment.

approximates a straight vertical line (mean contour). This is further demonstrated by the movement of the lower part of the grid representing the five contour angles toward the mean. The posttreatment profile varies moderately from the normal in its inclination to the skull but does so in a uniform manner. This produces normal profile contour. It should be noted that as subnasale has fallen back, total facial convexity has improved, but at the expense of increasing nose prominence.

TABLE VI. INTEGUMENTAL CONTOUR CHANGES OCCURRING WITH ORTHODONTIC TREATMENT

ANGLE	PRETREATMENT (DEGREES)	POSTTREATMENT (DEGREES)
XAG	- 4.0	- 1.5
XAF	17.0	13.5
XBE	19.0	17.0
XAC	-13.0	5.0
XDF	33.5	18.0
XCD	10.0	13.0
XAB	17.5	29.0
XBC	-41.0	-19.0
XDE	90.0	48.0
XEF	9.0	- 4.0
GAF	21.0	15.0
ACDF	46.5	13.0
CDF	23.5	5.0
ABC	58.5	48.0
DEF	81.0	52.0

SUMMARY

Modern orthodontics implies not only occlusal excellence, but also the positioning of teeth to produce optimal facial harmony for the individual patient. The soft-tissue veneer covering the teeth and bone varies so greatly that study of the dentoskeletal pattern may be inadequate in evaluating facial disharmony.

A method of direct integumental analysis is presented, employing angular readings that describe profile components to the skull as a whole (inclination angles) and to each other (contour angles). These readings are made from oriented lateral headplates exposed to show both hard- and soft-tissue detail.

The average morphology and variation of acceptable profiles are described, based on the Herron sample (a group of good faces picked by a panel of artists). The hypothesis is explored that average inclination, contour, and proportion is related to profile excellence.

Graphic comparison to the Herron sample by use of the integumental profile grid expedites the analysis of maloclusion deformity and the study of soft-tissue changes occurring during growth and treatment.

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EXTRINSIC FACTORS

T. M. GRABER, D.D.S., M.S.D., PH.D., CHICAGO, ILL.

INTRODUCTION

THE limitations of semantics are obvious when one turns to the dictionary for a definition of the word *extrinsic*. The No. 1 definition is: "Extraneous; not inherent; unessential." This is hardly the impression to be conveyed in the title of this article, for the factors falling under this heading are anything but unessential to the orthodontist. A better definition might be: "External; operating or coming from without." Even then, for the sake of the discussion, anything outside the teeth themselves falls under this heading. Only tradition and usage dictate this use of *extrinsic*, for many so-called extrinsic factors are in reality integral elements of diagnosis, therapy, and prognosis, intimately interwoven with the local factors. An arbitrary division calling for the discussion of local factors only is just as illogical, for it is not possible to divorce one from the other. For the sake of our program "flow," such a division has been made, at the risk of being repetitious, so that our present-day knowledge can better be subjected to a qualitative and quantitative analysis, or an objective appraisal.

Hereditary Predisposition.—In a logical sequence, the first topic of discussion should be hereditary predisposition, or the pattern type malocclusion. Under this heading might be listed: (1) facial type and its influence, (2) apical base dysplasias, or abnormal relationships of maxilla and mandible to each other and of the teeth to their respective bases, and (3) congenital defects. One of those considerations which blanket local and general etiological factors is the hereditary predisposition toward malocclusion. Facial type is one of a galaxy of characteristics likely to be transmitted from parents to offspring. Facial resemblances are often so striking that they provide source material for some of our more enterprising cartoonists and humorists. Obviously, in this matter of look-alikes, there is more than meets the eye or, to paraphrase a well-known saying, "heredity is more than skin deep." Facial typing is three dimensional. We are not merely a generation of profiles, as some of our orthodontic literature would have us think. Equally important are lateral and vertical considerations. The anthropologists gave us our clue a long time ago, but we chose to ignore it. Different ethnic groups and mixtures of ethnic groups have differently shaped heads. There are three general types (Fig. 1): the brachycephalic, or broad round heads; the dolichocephalic, or long narrow heads; the mesocephalic, or in between. This is, admittedly, an arbitrary division, and there are many

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Fig. 1.—Illustrations of the three facial types. *A*, brachycephalic, or the broad, round face; *B*, mesocephalic, or an example of the central tendency between the broad and short face (brachycephalic) and the long and narrow face (dolichocephalic); *C*, dolichocephalic, or the long and narrow face. Note trend from convex to straight profile.

gradations in between, with the racial admixture that makes up our population, but the lesson is still there. Stockard's³² work on crossbreeding of dogs at Cornell University, where he produced bizarre malocclusions, shows the possibilities of creating malocclusion as a resultant of mixing racial and facial types. Pilot studies on relatively pure ethnic groups in the Philippines, for example, seem to show significantly less incidence of malocclusion. With broad faces go broad cranial and facial bony building blocks and broad dental arches. With long and narrow faces go harmonious bony structures that house narrow dental arches. Unless we can change cranial and facial superstructures and reorient the bony trabeculae, stress trajectories, and supporting pillars and buttresses, along with their muscle attachments, we cannot significantly change arch form, much as we would like to, in our attempt to accommodate all the teeth.

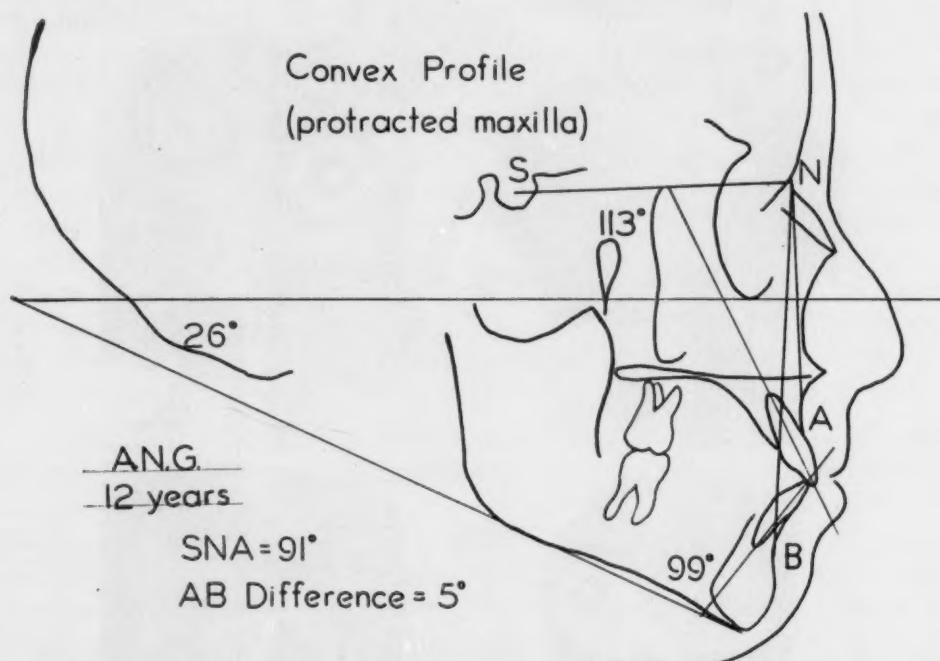


Fig. 2.—Patient A. N. G. Normal occlusion. Prognathic maxilla with respect to the cranial base. The incisors are procumbent and there is a relatively high apical base difference. (From Graber: AM. J. ORTHODONTICS, January, 1954.)

Somatotyping carries over into profile analysis. Brachycephalic persons usually have convex faces. Dolichocephalic persons have relatively straight faces. Mesocephalic faces can be convex, straight, or concave, depending on the ethnic group. In persons with clinically excellent occlusions, Nature harmonizes the dental structures according to the facial type. In convex faces (Fig. 2) the upper and lower incisor inclination is more procumbent than in the straight type of face. If the maxilla is protracted or protrusive with respect to the cranium, facial profiles may be concave, straight, or convex, but the most common type is convex. This means more procumbent maxillary and mandibular incisors and a normally greater anteroposterior apical base difference.

In persons with a retracted maxilla (Fig. 3) in relationship to the cranial base, all three facial profiles are possible again, but the straight face is the more common and incisor inclinations are more upright. Here, anteroposterior apical base differences are small. Malocclusions presenting with significantly large apical base differences—or maxillomandibular dysplastic relationships—may well mean a poor therapeutic prognosis. We can look at as many movie stars and beauty queens and princesses as we wish, but we cannot impose preconceived ideas of facial form and beauty on structures whose foundation is built for

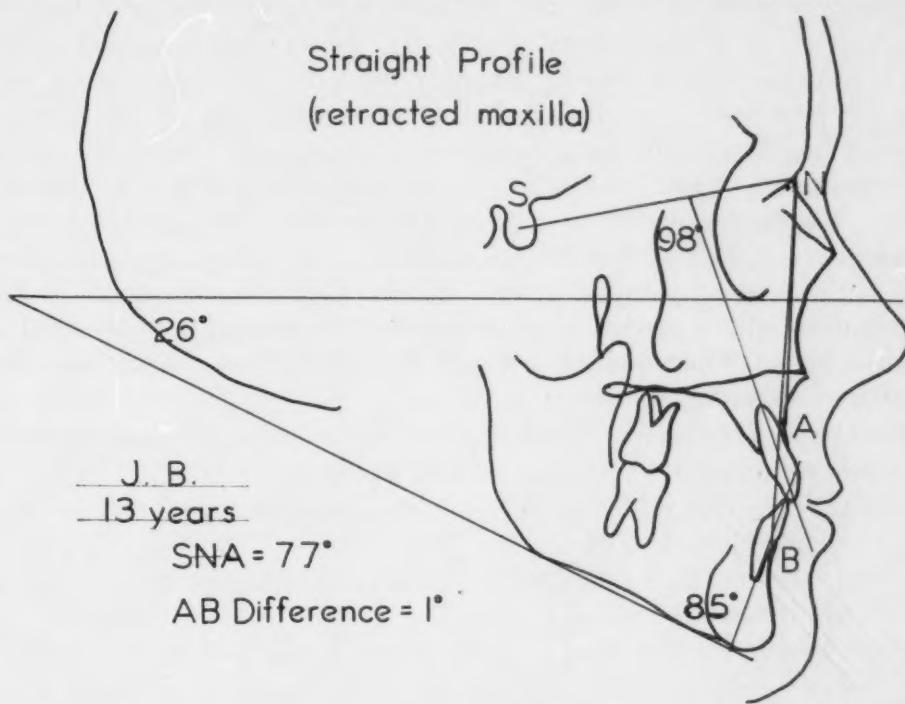


Fig. 3.—Patient J. B. Normal occlusion. Retrognathic maxilla with respect to the cranial base. The incisors are upright and there is a small anteroposterior apical base difference. (From Gruber: AM. J. ORTHODONTICS, January, 1954.)

something else. Call it human engineering or whatever you wish, but there is no one ideal, if stable therapeutic results are desired. The hereditary pattern of the patient we are treating at the time is vitally important. Corollary to this predominance of the morphogenetic pattern must be the recognition of limitations imposed by bone inequities, as mentioned by Sicher³³ in his discussion of "Skeletal Disharmonies and Malocclusions." This is all the more important since approximately two-thirds of the patients under orthodontic treatment have Class II, Division 1 malocclusions. Anteroposterior basal malrelationships, inherited or otherwise, as influenced by the demands of facial type, make certain demands on therapy, impose certain barriers, make tooth sacrifice considerations possible, or call on growth and development to a lesser or greater degree depending on the patient's age, sex, basal dysplasia, tooth size, musculature, function, etc.

No less important are the tooth-to-basal-bone relationships. In the past the orthodontist has been too willing to blame individual local irregularities and crowding on premature loss, prolonged retention, accidents of eruption, etc. In reality, these conditions may well be symbiotic consequences of a broader and more encompassing problem which is extrinsic in nature, if we can call the hereditary pattern extrinsic. Our latest information plays down these convenient local crutches, but there are still many loopholes in our information which tell us that most of our Class I malocclusions are pattern problems. Whether the discrepancy between tooth material and basal bone is inherited as a unit from one parent or, as some observers suspect, jaw size and tooth size are separate genetic elements traceable to one parent or the other, the configuration of the teeth and jaws seems predetermined in a large percentage of the cases. Of course, environmental and functional factors can and do modify the pattern. The concept of a set and irrevocable pattern is no more tenable than that of no pattern. Dobzhansky¹ refers to a genetically predetermined plasticity making environmental influence possible. Congenital defects test the Dobzhansky thesis. In cleft palate, heredity plays a role in at least 50 per cent of the cases. There is essentially a pattern of normal growth of the palate, if it is left undisturbed, but environmental influences in the form of inept surgery can change this pattern markedly.

Environmental Factors.—Environmental factors of an extrinsic nature can be divided arbitrarily into prenatal, birth, and postnatal periods.

The role of prenatal influences on malocclusion is probably very small. Uterine posture, fibroids of the mother, amniotic lesions, etc., have been blamed in the past. Infants born with defects caused by such factors usually show few signs of malformation by the end of the first year of life. The deformity thus appears to be temporary in nature. Even in cases of so-called micromandible, or Pierre-Robins syndrome, there are tremendous increments of adjustive growth that largely eliminate the original malformation.

To say that malocclusions are a resultant of birth injuries is to delve into teleology, or retroactive reasoning, in most cases. Birth is a tremendous shock to the newborn, but the cranial bones slide more and mold more than the facial and dental areas. The plasticity of the structures is such that any injury would be of a temporary nature, except in rare instances. Entirely too many malocclusions have been blamed on forceps deliveries, when a readier explanation is found by looking at the teeth and jaws of the parents.

Under the heading of postnatal extrinsic environmental factors may be listed: (1) predisposing metabolic climates, endocrine abnormalities, and disease; (2) the temporomandibular joint; (3) the dynamic role of the musculature; and (4) habit factors (this is really a part of the muscle picture, but other factors are involved).

A discussion of metabolic climate consists primarily of the diseases that affect that climate. Exanthematous fevers are known to upset the developmental timetable, and they often leave their permanent marks on the surfaces of the

teeth. The exact effects of acute febrile disturbances on the development of occlusion, however, are not known. Some specific diseases may be potent makers of malocclusions. Nutritional deficiencies are relatively uncommon here, but a visit to the Far East and the Middle East where over two billion people (the majority of the earth's populace) live will show that nutritional deficiencies satisfy one definition of the word *normal*, namely, "the usual." Such nutritional disturbances as rickets can produce real malocclusions. Diseases with a paralytic by-product (for example, polio) are also capable of producing bizarre malocclusions. Diseases with muscle malfunction, such as cerebral palsy and muscular dystrophy, again have characteristic deforming effects on the dental arch. The effects of chronic diseases occasionally can be demonstrated, but here again exactitude is not the order of the day. Salzmann² writes: "Dento-facial deviations may be concomitant with, pathognomonic of, or sequelae to local or general bodily disturbances which constitute the basic etiologic factors. These factors may manifest themselves at any time after fertilization of the ovum and may at times be of a sub-clinical nature, or they may no longer be evident when the patient is examined. They may also cause deviations which are incidental expressions of normal growth. It is questionable whether they ever act singly." Some case histories of orthodontic patients place a lot of emphasis on the general health background, listing the childhood diseases and the ages at which they occurred. For routine orthodontics, most of the information is of doubtful value at the present state of development of our information. The linking of cause and effect is arbitrary in the majority of cases. Usually the information is not used at all or, when it is, it serves only as a gratuitous contribution to the etiological cause. In some instances the information serves as "window dressing."

Endocrinopathies provide a more direct cause-and-effect basis. Frank pituitary and parathyroid disturbances are rare, but the effect on growth and development is striking when these disturbances occur. Less dramatic, but of more importance to the orthodontist, are hypothyroid problems. Grimm³ says that 2 to 3 per cent of our population may fall in this category. Abnormal resorption patterns, delayed eruption patterns, and gingival disturbances go hand in hand with hypothyroidism. Retained deciduous teeth and individually malposed teeth that have been deflected from their normal eruptive path are frequent in these patients. How does this work? We do not know as yet. The exact tie-in between reduced thyroid, its effect on the other endocrine secretions, delayed endochondral bone formation, abnormal blood sedimentation and blood cholesterol, and a low basal metabolic rate and dental abnormalities is a good research project for the present, so that we may have the answer in the future. The fact that we do not know the mechanism does not prevent us from recognizing and intercepting the effects. Many a subclinical case of hypothyroidism has been pointed out to an unaware patient by an alert orthodontist looking at a set of casts, headplates, and dental radiographs. Equally provocative are the hypothyroid background and reduced basal metabolic rate in the majority of patients with root resorption.

Temporomandibular joint disturbances are included under the heading of extrinsic factors. Do temporomandibular joint morphologic variations cause

malooclusions, or do malooclusions cause temporomandibular joint morphologic change and pathologic function? What is the interrelationship? Controversy still limits answers to these questions but it does appear, from a survey of the works of Thompson at Northwestern University and others particularly interested in temporomandibular joint problems, that the occlusal relationships are the primary consideration, with the temporomandibular joint response a resultant.

The dynamic role of musculature is another extrinsic factor. In the last few years the "plaster orthodontist" has been able to augment his artistic plaster facsimiles of the teeth and associated oral structures with cephalometric headplates. The information gained has been valuable. Some men have been so enthusiastic in their use of cephalometric x-rays that they have been facetiously labeled "headplate orthodontists." Both plaster models and cephalometric headplates are static records, however—at best, periodic records of initial morphology and subsequent changes in that morphology, as influenced by the original hereditary pattern, by metabolism, by disease, by growth and development, by the orthodontist's own efforts and by function. Recent electromyographic research by Hill,⁴ Hilderbrand,⁵ Ebert,⁶ Gilson and Mills,⁷ Lindsley,⁸ Smith,⁹ Cuthbert and Denslow,¹⁰ Hoefer and Putnam,¹¹ Kugelberg and Skoglund,¹² Clark,¹³ and others has called attention to the dynamic role of the musculature. The works of Moyers,¹⁴ Pruzansky,¹⁵ Carlsoo,¹⁶ and Jarabak¹⁷ particularly have infused new enthusiasm in orthodontic research. At the risk of being accused of adopting strong-arm tactics, by calling these men "muscle men," I suggest that their work may well bring into being a third type of orthodontist—the "myographic orthodontist." This is not new, for Alfred Paul Rogers¹⁸ and his followers pointed the way to function a long time ago, as did Simon,¹⁹ but more objective and definitive means of appraising muscle activity promise new information on the etiology of maloclusion and on the stability of the expansionist aims of the orthodontist.

Electromyography—the brightest star in the orthodontic firmament now—has had a meteoric rise as the orthodontist has moved from stable to dynamic or functional concepts of occlusion and has felt the need for some method of evaluating such terms as *hypotonic*, *hypertonic*, *hypertrophic*, *flaccid*, *hypactive*, *hyperactive*, and other adjectives used to qualitate and quantitate the soft tissue that drapes the denture and denture bases.

I do not propose to go into the technical aspects of electromyography at this juncture. In its simplest terms electromyography is an appraisal of the electrical activity of muscle. A minute amount of electric current is created with the contraction of muscle. Theoretically, we would like to measure this action potential, or action current, for one single motor unit. Actually, this is practically impossible, particularly with the use of surface electrodes. This creates problems, since motor units do not contract in harmony. A greater work load means more frequent contraction, but also more motor units acting in asynchrony to produce smoother muscle function. This masks the individual wave form, making recordings difficult to study at times. Despite this, the ability of modern

electronic equipment to pick up, amplify, and record electrical discharges from muscle activity, with a minimum of distortion, gives the physiologist a potent tool, if used carefully. Current means of recording muscle activity as outlined by Moyers,¹⁴ Carlsoo,¹⁶ Tulley,²⁰ Pruzansky,¹⁵ and Jarabak¹⁷ are the crystographic inkwriting recorder, the cathode ray oscilloscope, and the magnetic tape recorder. Pruzansky and Jarabak, and later Perry,²¹ have made interesting use of the tape recorder, converting the firing of muscle units into sound. It is thus possible to arrive at an accurate resting position, with minimum activity of muscle fibers, and to recognize characteristic movements of muscle by the variations in the rumbling noise produced by the recorder.

Hotz,²² Gwynne-Evans,²³ Ballard,²⁴ Brodie,²⁵ Rix,²⁶ Baume,²⁷ Winders,²⁸ and many others have recently studied the role of the musculature in malocclusion. Their observations, in the light of objective myographic research, form the basis of our knowledge on this subject today. As dentists, we are prone to think of muscles primarily as masticating elements. The dental students learn that the masseter, temporal, and external and internal pterygoid muscles are "muscles of mastication." This is an outmoded concept. These muscles, as well as those other facial muscles with which they are intimately associated, have other functions that are equally as important or more so. The average person eats three times a day, but he swallows once a minute all day long, he breathes constantly, and he talks a good part of that time, too. In addition to mastication, deglutition, respiration, and speech, there is an even more important role of the musculature—that of posture. As electromyographic studies have shown, even at physiologic rest, muscle is in active function, maintaining a status quo of soft-tissue and skeletal elements. The muscles of mastication are only a part of the postural muscle chain, maintaining the mandible in a contant physiologic rest position, when one is not engaged in mastication, deglutition, respiration, and speech. But the telltale modulated rumbling heard in the myographic tape recording of normal occlusions provides evidence of a certain level of activity. Excellent myographic studies of posture by Jarabak and Moyers on patients with malocclusions show that not only is active function disturbed, but the nice, even synchronous rest picture seen in normal occlusion is often replaced by an erratic fibrillatory type of contraction of a higher level of activity. This, of course, can and does change bone morphology and is a logical explanation for departures from the normal (Figs. 4, 5, and 6). It is this constant postural muscle relationship, as modified by malocclusions or by those active but less frequent functions of mastication, deglutition, respiration, and speech, that has the most profound and lasting effect on the facial and dental morphology—all within the guiding frame of the hereditary pattern and the growth and developmental processes. I have not forgotten the tongue, for it, too, by virtue of its size, shape, and postural position, is a part of the mosaic of muscular mechanics. It is this postural position, or changes in the resting positions of the draping musculature, then, that is the more likely basis for the resulting bone morphology, as far as the orthodontist is concerned. This does not mean that active function cannot produce malocclusion; it can, particularly if the hereditary pattern is such that

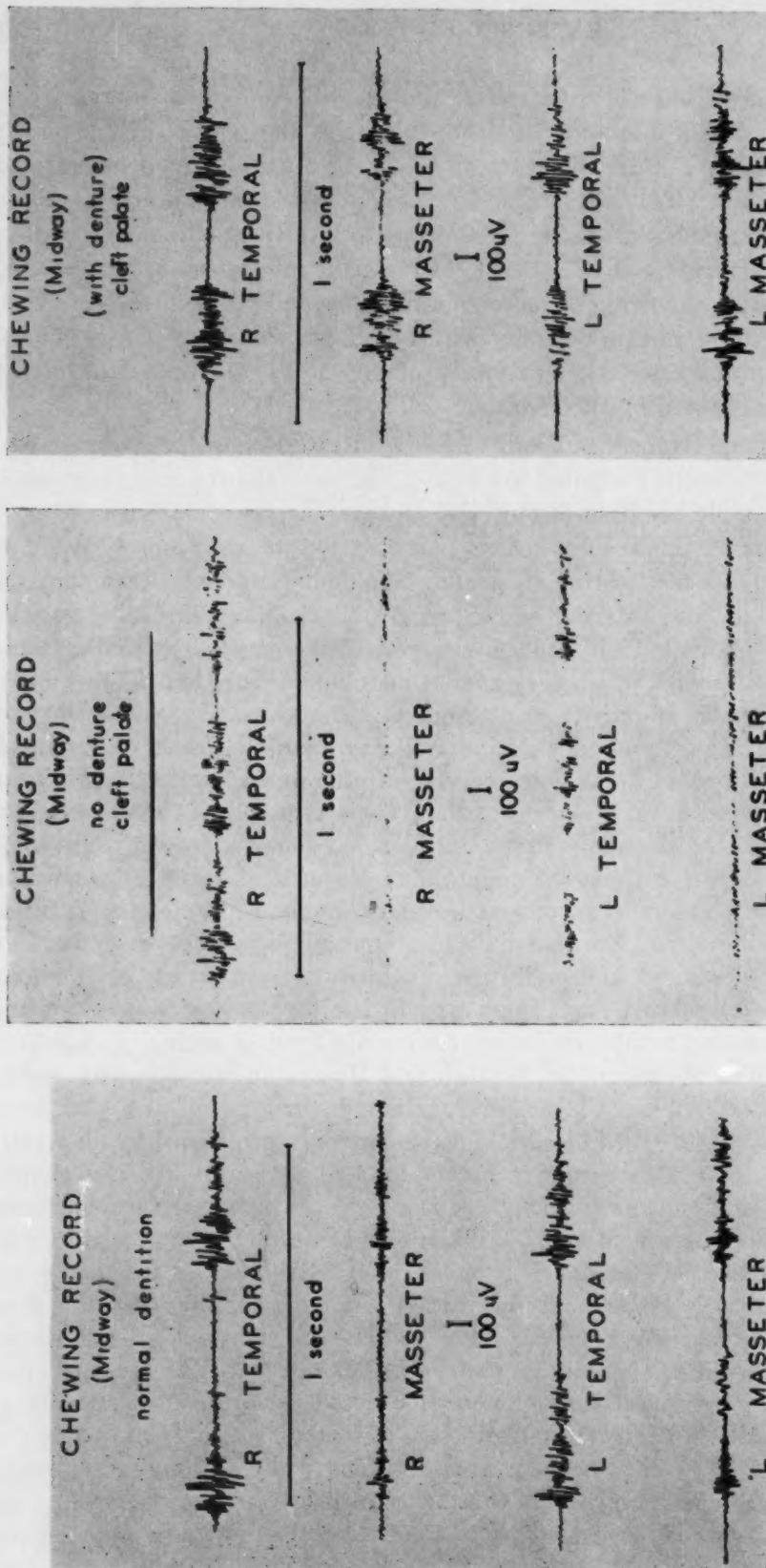


Fig. 4.

Fig. 4.—Electromyographic record of temporal and masseter muscles during a chewing exercise. The occlusion is normal. (Courtesy of J. R. Jarabak.)

Fig. 5.—Electromyographic record of temporal and masseter muscles performing the same chewing exercise as in Fig. 4. The patient has a repaired cleft palate and deficient vertical dimension. Muscle activity is quite different. (Courtesy of J. R. Jarabak.)

Fig. 6.—Electromyographic record of patient in Fig. 5, performing same chewing exercise. However, a denture has been placed to restore the deficient occlusal vertical dimension. Compare this record with the two previous recordings. (Courtesy of J. R. Jarabak.)

Fig. 5.

Fig. 6.

the malrelationship of the maxilla and the mandible makes normal muscle function difficult and if the compensatory muscle activity then becomes essential in performing requisite tasks. Specifically, good examples of this are seen in Class II and Class III malocclusions. Lischer's excellent drawings (Figs. 7 and 8) illustrate the point. Normally, at rest there is a balance of extraoral and



Fig. 7.—Drawing by Lischer to show normal relationship of teeth and supporting structures and of musculature. This illustrates the balance of appositional extraoral and intraoral soft-tissue elements. (From Lischer: Principles and Methods of Orthodontics, Philadelphia, 1912, Lea & Febiger.)

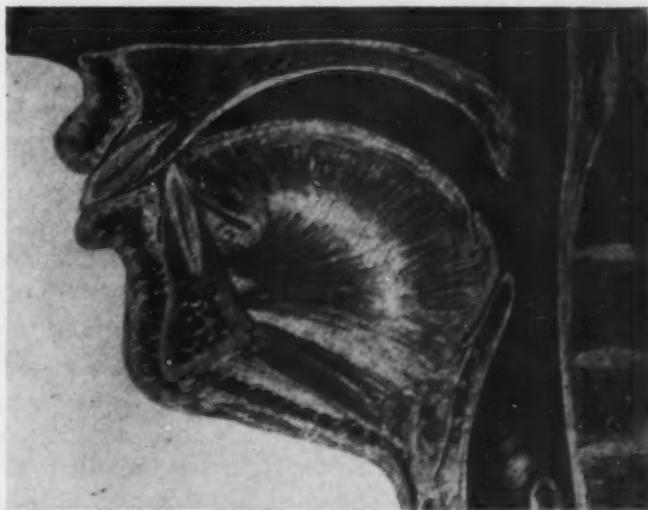
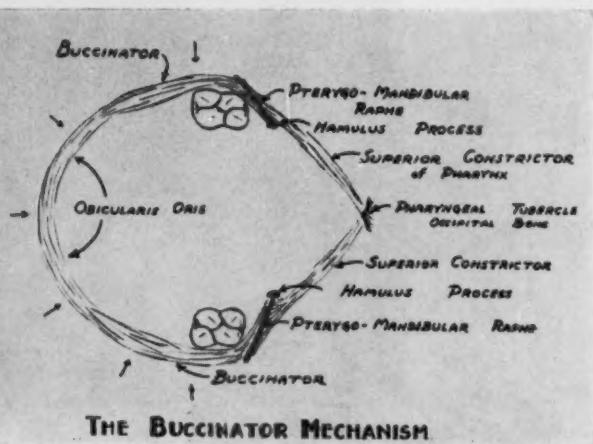


Fig. 8.—Drawing by Lischer to show the abnormal relationship in Class II, Division 1 malocclusions. Note the change in tongue position, and the lower lip cushioning to the lingual side of the maxillary incisors during active function and at rest. The latter is a potent deforming mechanism. (From Lischer: Principles and Methods of Orthodontics, Philadelphia, 1912, Lea & Febiger.)

intraoral muscular forces, with the buccal and perioral musculature having a passive restraining influence on the anterior displacement of the teeth. This can be shown by wrapping a piece of rubber dam over a skull, or by drawing a diagram of the restraining muscle band (Fig. 9). The buccinator mechanism runs posteriorly to the pterygomandibular raphe, decussating with fibers of the superior constrictor muscle that carry on around and anchor at the pharyngeal tubercle of the occipital bone. This bony attachment is not essential to maintain the status quo, however, for all the facial muscles are intimately related to the postvertebral, prevertebral, and cervical musculature, so that a change in one muscle would influence relationships with the other muscles. In Class II, Division 1 malocclusions, where there is an excessive overjet, it is difficult to close the



A.



B.

Fig. 9.—A, Restraining effect of oral and facial musculature. Diagram by Weinstein (B) depicts the delimiting effect of the musculature.

lips properly. No longer do the upper and lower lips contain the denture. Rather, the lower lip cushions behind the maxillary incisors at rest and with every swallow—at least once a minute all day long—the abnormal contraction of the mentalis muscle and compensatory function of other perioral muscles propel the maxillary incisors labially. The mandibular anterior segment is frequently flattened by the postural and functional abnormality of the lower lip. Thus, the original malocclusion may have been the result of a hereditary pattern, but this has been made worse by the compensatory malposition and malfunction of the associated musculature. Unfortunately, this becomes a vicious circle. The greater the overjet, the more habitual the interposition of the lower lip nestled between the labial aspect of the mandibular incisors and the lingual aspect of the maxillary incisors. That these muscles function abnormally is clear, and electromyographic evidence only serves to record in black and white the departure from the normal²⁹ (Figs. 10, 11, 12, and 13).

This leads us directly into a discussion of habits as causative elements in malocclusions. I am convinced that much of the controversy that exists here can



Fig. 10.—Patient prepared with surface electrodes in place to record electrical activity of upper lip, mentalis, and suprathyroid muscle elements. (Courtesy of L. Schlossberg.)

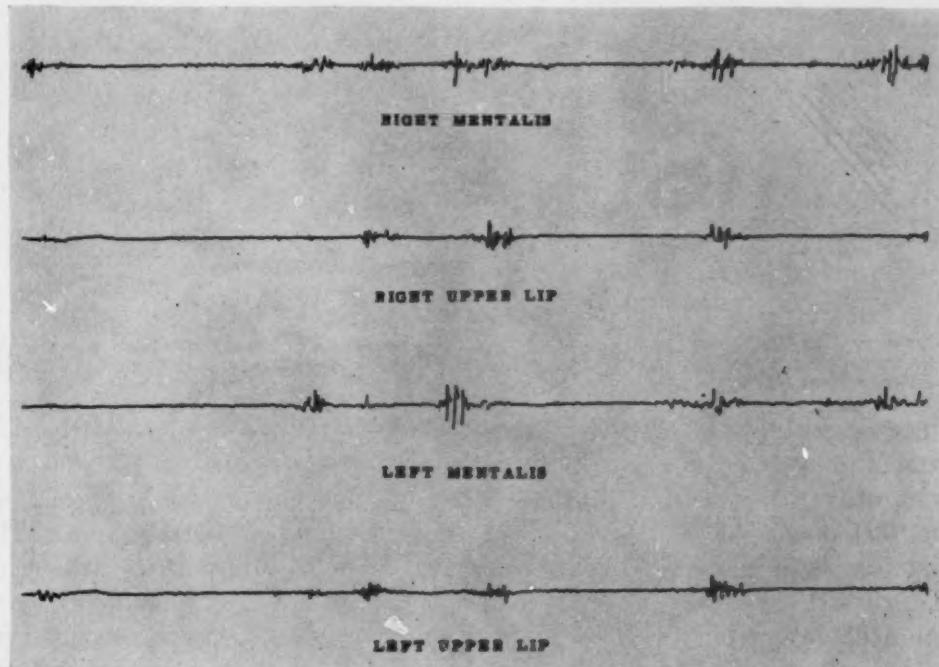


Fig. 11.—Electromyographic records of patient with normal occlusion, showing the activity of the upper lip and mentalis muscles during a standard speech exercise. (Courtesy of L. Schlossberg.)

be resolved by qualifying and equating all factors. The basis for this observation is a ten-year study of thumb- and finger-sucking habits at Northwestern University. A number of questions prompted the study. Are finger-sucking habits harmful or not? Is a real need for love and affection the basis for the habit? Are these children "rejected"—a by-product of our modern society? Is there real psychic trauma in normal children, if attempts are made to break the habit, as claimed by Korner and Reider,³⁰ for example? Is thumb-sucking an expression of inadequate suckling, a symptom of a broader behavior problem, or an attention-getting mechanism? Is the deformation of the developing teeth and jaws temporary or permanent (Fig. 14)? There are no simple "yes" or "no" answers; much depends on a combination of factors. The student of

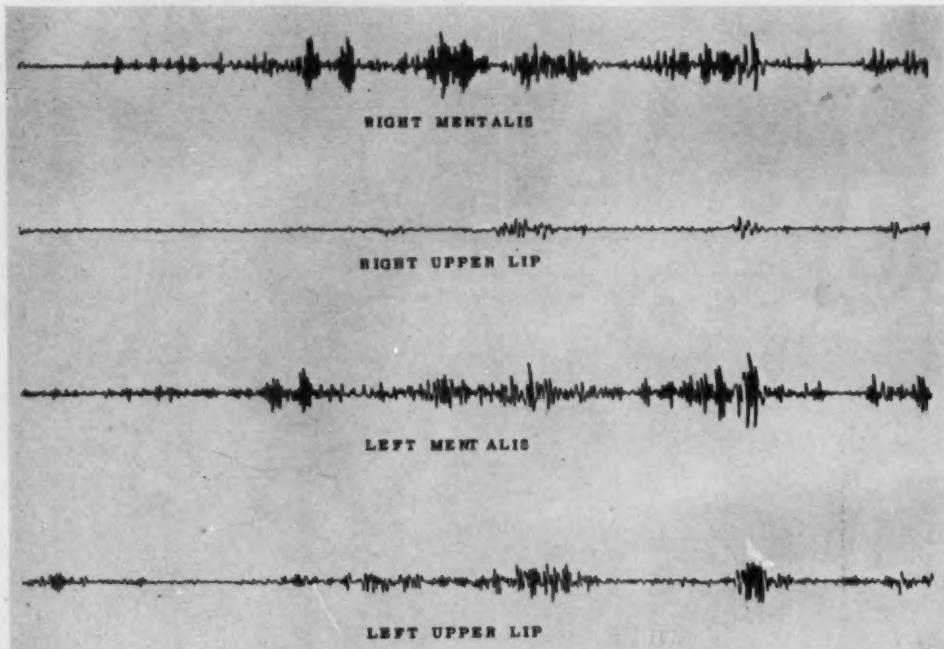


Fig. 12.—Electromyographic recording of a patient with a Class II, Division 1 malocclusion. There is increased mentalis activity, as shown by a comparison with Fig. 11. (Courtesy of L. Schlossberg.)

child development who points to sucking habits as mere expressions of the normal hand-to-mouth movements of infancy is right. The psychologist who says peremptorily that sucking habits are behavior problems, perfectly normal, or habits that should not be interfered with is also right within certain limits. The pediatrician who advises the anxious parent not to worry for there will be no harm may well be correct. The orthodontist who throws up his hands in horror at the deliberate deformation of the developing teeth and jaws is not suffering from hallucinations. The malocclusion is real. The situation is analogous to the story of the three blind men who were led to an elephant and asked to tell what it was. The first felt the tail and said, "Monkey." The second grabbed the trunk and cried out, "Snake." The third gingerly probed the massive leg and said, "Tree." The contradiction is apparent, not real. From our study,

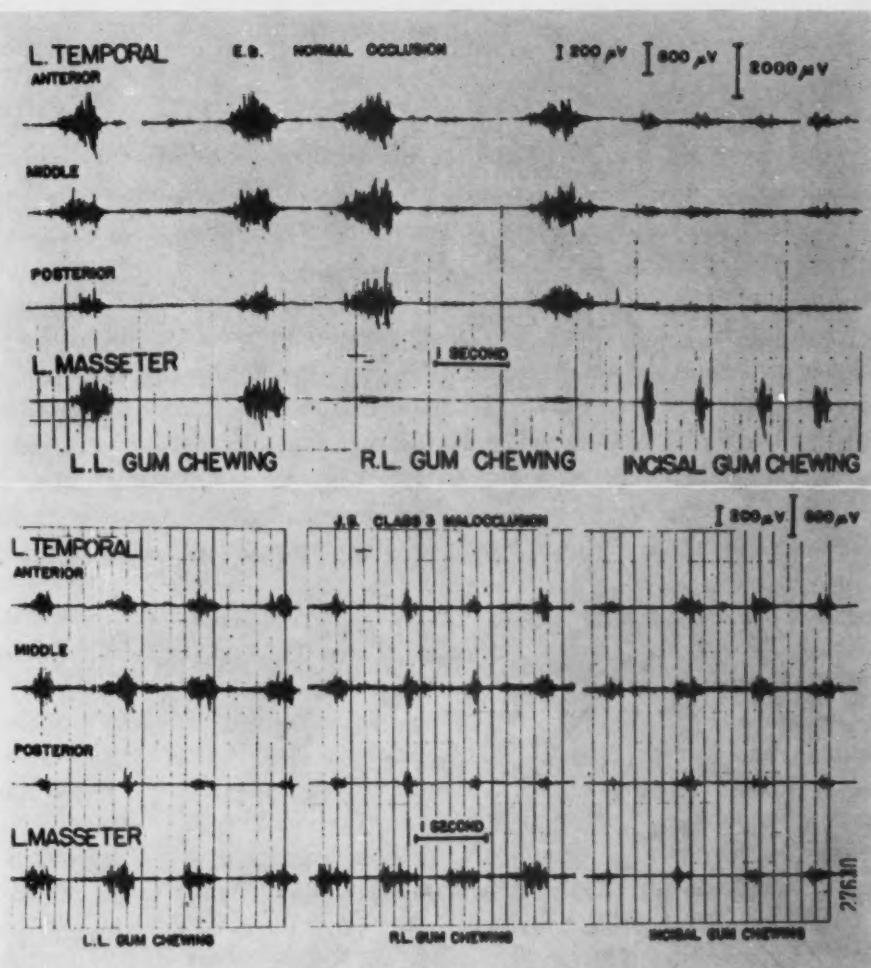


Fig. 13.—Electromyographic recordings of normal occlusion and Class III malocclusion, showing the change in masseter and temporal patterns of activity. (From Pruzansky: J. Am. Dent. A. 44: 49, 1952.)

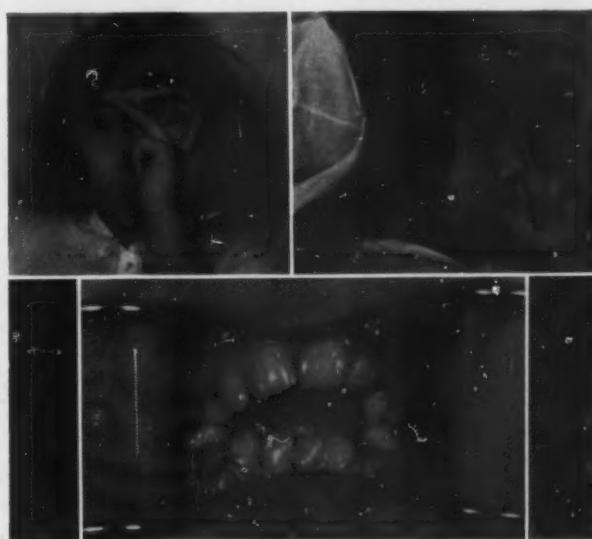


Fig. 14.—Malocclusion associated with a confirmed finger-sucking habit. The perioral muscular function, both at rest and during mastication, deglutition, and speech, is abnormal. (From Graber: AM. J. ORTHODONTICS, September, 1956.)

it is obvious that all cases are not the same. There are many possibilities in the combination of factors and the degree of importance which the extenuating circumstances assume. There are certain broad observations, however. Geselle has shown that the hand-to-mouth movement is just one of a series of akimbo movements in infants up to the age of 1½ years. They may persist into the second or third year of life. Displacement of the teeth by the habit itself is usually temporary and the habit will disappear spontaneously, unless the parent converts it into an attention-getting mechanism, prolonging the habit and creating problems for the psychologist and the orthodontist. Johnson showed, in his study of 989 cases at Northwestern University that at least 17 per cent could ascribe part of their dental deformity to thumb- and finger-sucking. More significant information is gained by comparing the degree of malocclusion with the duration of the habit. In his group, 50 per cent had stopped the habit by the end of

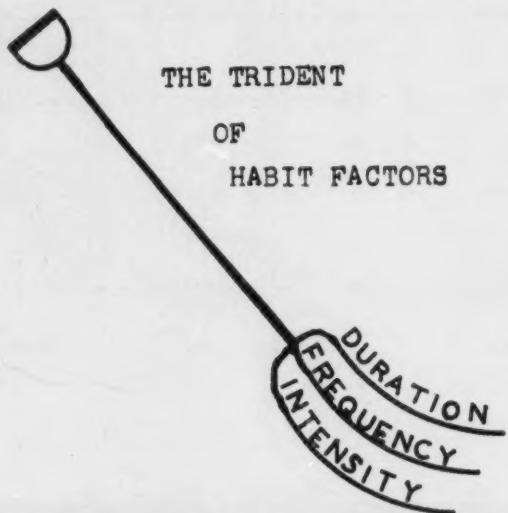


Fig. 15.—Qualifying and equating factors that must be evaluated before attributing malocclusion to abnormal habit patterns.

the third year of life and their occlusions were only slightly disturbed by the habit, or not at all. In the children whose habit persisted beyond the third year of life, the greatest malocclusion was noted. It is quite apparent to us all that we cannot single out a particular habit as the sole etiological factor, even in these cases of frank finger-sucking. Many of the children who had the habit probably would have had malocclusions anyway, with thumb-sucking incidental. However, where the patient already has a tendency toward mandibular underdevelopment, with an excessive overbite and overjet, displacement of the teeth by perverted sucking habits is easier. The equating and qualifying level is literally a trident (Fig. 15). This is the common denominator. The three prongs are *duration*, *frequency*, and *intensity*. Duration, frequency, and intensity must qualify the conclusions of the psychologist, pediatrician, and orthodontist in determining the existence and degree of structural and functional deformity. It is easy to produce 100 cases of thumb-sucking with no physical deformity. With

a bias toward deformation, the orthodontist can produce 100 cases with malocclusions. In the first instance, neither frequency nor duration would be of sufficient magnitude and the thumb-sucking is probably a sporadic habit resorted to at nap time or when going to bed. No inherent maloclusion served as a predisposing factor, and the finger habit was probably discontinued by the end of the third year of life. In the orthodontic group many of the patients would be orthodontic candidates without the finger habit, but deformation by pressure habits would be superimposed on the original maloclusion, and case histories would likely disclose confirmed, intense sucking over a long period of time. Thus, the argument is not merely over whether or not the child had the habit, for many infants do (a perfectly normal phenomenon); rather, the question is "How intense was the pressure and for how many years did the habit persist beyond the time it would normally have been dropped?" A re-evaluation of all observations in the light of these criteria is required before a definite answer can be given.

In the light of what we know today, we can say that thumb-sucking is a normal phenomenon at one stage of an infant's development. Habits that do not continue beyond the third year of life usually produce little or no permanent deformation, if there is a normal occlusion to start with. When the habit continues beyond the third year, is of moderate intensity, where there may be an original Class II, Division 1 maloclusion, it is reasonable to expect the pre-maxillary segment to be forced upward and outward. The lower incisors are often crowded and a unilateral or bilateral buccal cross-bite is often present. Physical damage of this type perpetuates in the adult dentition. In a study of open-bite cases at Northwestern University several years ago, a significant number of the patients had histories of finger, thumb, and tongue habits in childhood.

In children with these abnormal pressure habits, if the displacement of the front teeth is severe enough, even after the habit is broken, the lower lip assumes a habitually abnormal position, cushioning to the lingual aspect of the maxillary teeth, as shown already. Both posture and active function accentuate the discrepancy. Increased buccal pressures narrow the maxillary arch particularly, and a unilateral cross-bite results as a convenience swing to the right or left attempts to compensate for the bilateral narrowing. Our continued study has left us with the strong impression that, once the compensatory lip and tongue habits take over, they are more potent than the most confirmed finger habits (Figs. 16 and 17). Finger habits, at worst, are not constant but, with the lip or tongue constantly nestled in the excessive overjet between the upper and lower front teeth, even when there is no active function, the struggle between muscle and bone is no struggle at all. The teeth yield.

The same observations govern other oral habit problems. Duration, intensity, and frequency are prerequisites. Sporadic leaning habits have frequently been singled out as prime causative factors in maloclusion. There is little basis in fact to support such contentions. In a Class II, Division 2 maloclusion, for example, heredity offers a much more likely etiological consideration. The tongue-thrust habit is another extrinsic factor commonly credited with

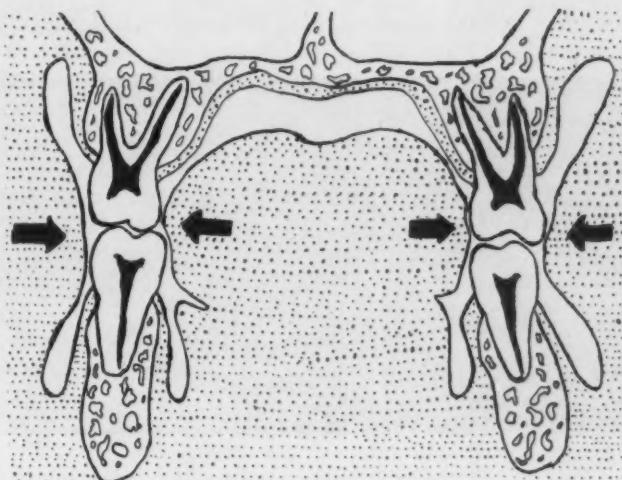


Fig. 16.—*A*, Finger-sucking habit with a potent deforming leverage factor. *B*, Common malocclusion associated with confirmed finger habit problems. There is a reasonable likelihood that the damage is attributable to the habit and the associated abnormal perioral muscular function. *C*, Adult open-bite problem with a long history of thumb-sucking and abnormal tongue and lip muscle activity. The latter probably has been brought into play as a compensatory mechanism.

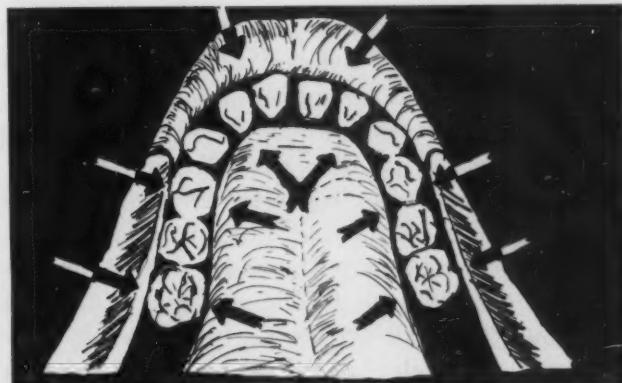


Fig. 17.—The postural and functional activity of the lips and associated muscles is not normal here. Whether this activity is primary or secondary in nature, the malposition of the anterior teeth can be traced to this problem.

causing maloclusions. But we must first decide "the chicken and egg" question. Which came first—the tongue-thrust habit or the maloclusion? Has abnormal tongue function deformed what was originally a normal occlusion, or has an original maloclusion demanded abnormal tongue function which, in turn, has compounded the damage? A Class II, Division 1 maloclusion, with an excessive overjet, requires the tongue to move further forward to help close off and create the partial vacuum necessary for deglutition. In open-bite cases, the same functional analysis can be made with validity. In many of these problems,



A.



B.

Fig. 18.—Drawings by Haralabakis, showing the balance of postural and functional forces inside and outside the dental arches.

tongue function is an associated factor—a compensatory muscle activity, as shown so well by Moyers and Schlossberg's electromyographic studies comparing normal occlusions with Class II, Division 1 occlusions.^{14, 29} If active function is, indeed, a prime etiological element, we had better be prepared to rule out other strong candidates for the same honors, namely, steep mandibular planes and

tongue size and posture. We must be careful of how we assign cause and effect in orthodontics, as much of our knowledge is still based on clinical observation and teleology is an irresistible attraction. The study by Winders²⁸ of Northwestern University, which won the American Association of Orthodontists Research Section prize last year, created quite a stir in some circles. Winders found that during function the force exerted by the tongue was as much as four times as great as the balancing buccal and labial musculature. Did this make untenable the concept of denture stability as a result of balanced external and internal forces? At first glance, it did. But the final answer comes from an analysis of all forces—not only active function, but less active but more potent postural



Fig. 19.—A, Malocclusion associated with congenital aglossia. (From Eskew and Shepard: AM. J. ORTHODONTICS, February, 1949.) B, Casts of patient with macroglossia.

forces. I presented illustrations earlier that show the withholding effect of the buccal and labial musculature. Haralabakis' drawings show this well (Fig. 18). Even at physiologic rest, a certain amount of motor units are functioning in the muscles. Denture position is not determined merely by summing up all fleeting functional efforts. These make up only a small percentage of the total time-unit forces. Rather more important is the less dramatic but constant postural effort. The mere presence of tongue and cheek muscles—of tissue masses—influences the shape of the dental arch. The absence of the tongue contributes to a bizarre malocclusion, as shown by Eskew and Shepard,³¹ while the opposite (macroglossia) fans out the teeth despite the presence of the external muscle layer (Fig. 19). Those of us who have tried to move teeth against a scarified and unyielding repaired cleft lip also appreciate the restraining effect of this external tissue layer.

Thus, we see that the dental arch is a resultant of many things, including hereditary pattern, as modified by postural and functional muscle forces, by habits, disease, injury and perhaps by orthodontics.

And so I penned
It down, until at last it came to be
For length and breadth, the bigness which you see.
—(John Bunyan, *Apology for Pilgrim's Progress*)

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SOME ILLUSORY PHENOMENA OF IMPORTANCE IN ORTHODONTICS

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INTRODUCTION

THE saying, "Seeing is believing," is correct only if the observer is unaware of the prevalence of visual illusions. The more conscious one becomes of the fallibility of visual impressions, the more he will develop a healthy skepticism of the accuracy of his visual judgment. Furthermore, an understanding of the principles according to which his judgment is distorted will aid him in minimizing or eliminating the errors into which we are all led.

An illusion is defined¹ as: "An impression from experience which does not correctly represent the objective situation outside the observer." Illusions are a part of normal perception, and should not be considered as denoting imperfections in the observer. Illusions should be distinguished from hallucinations, which are pathologic impressions of nonexistent forms, sounds, etc., and from delusions, which are pathologic impressions about the person's own identity, stature, importance, etc.

A visual impression is the result of a rather complex series of physical, physiologic, and psychologic events which can be roughly divided into three phases. *Stimuli* include not only the object viewed and the reaction of the optic nerve to the patterns, intensity, and color of the light falling on the retina, but also the kinesthetic stimuli of the muscles which control the eyeball, the lens, and the orientation of the observer. *Perception* is the registration of the stimuli received in the mind, their integration into a pattern or form, and the cognition or recognition of such pattern or form. An *impression* relates the perception to previous experience of the observer and indicates to him what the stimuli represent. For example, an architect's sketch is perceived as a sheet of paper with lines drawn on it, while the impression is that of a three-dimensional building.

The representation of an object viewed may be distorted in any or all of the phases mentioned above, resulting in a visual illusion. A mirage is an illusion created entirely outside the observer. The illusion shown in Fig. 1, A, in which the white square appears larger than the black although they are actually the same size, is produced at the retina, where light "spills over" onto adjacent nerve endings. The illusion in Fig. 1, B is a distortion or error of perception, the upper of the two equal horizontal lines appearing shorter because the entire figure in each case influences the judgment of length. By no effort of

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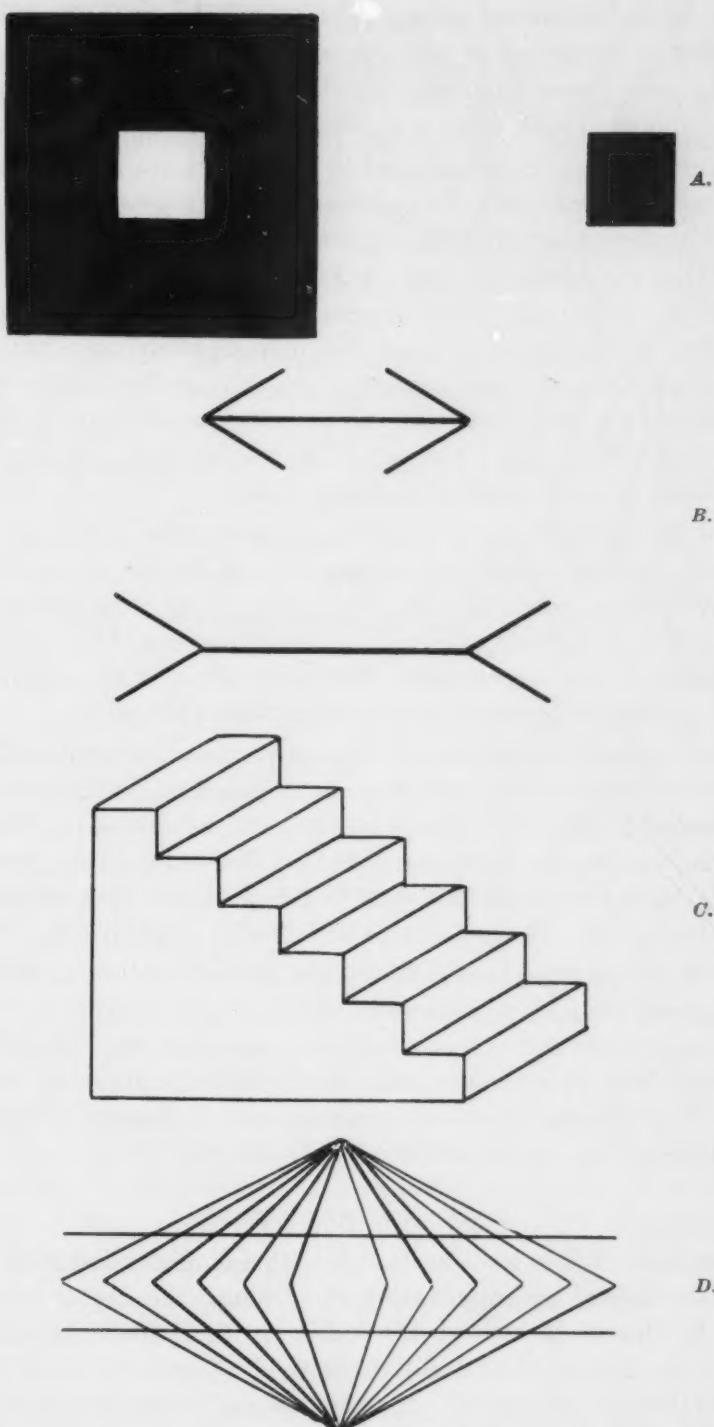


Fig. 1.—*A*, Error in stimulus. The white square appears larger than the small black square, although they are equal in size. *B*, error in perception. The two horizontal lines are actually equal in length. *C*, Error in impression. This staircase can be seen as though viewed from above or as though viewed from below, an example of "reversible perspective." *D*, Distortion of direction. The two horizontal lines are actually straight and parallel.

the will or reasoning can we make the lines appear equal. The illusion in Fig. 1, C contains no distortion of stimulus or of perception, but is one of impression. The observer sees a staircase which may appear to be viewed from above but he can, almost at will, make it appear as though viewed from below.

Illusions produced in stimuli and in perception are not usually correctible by mental effort. Only actual measurement, where possible, can ascertain the true status of the object viewed. No matter how many times one measures to determine that the horizontal lines in Fig. 1, D are straight and parallel, they still appear to be curved. Illusions occurring entirely in impression, however, are amenable to mitigation or even elimination when their nature is understood. A black and white photograph of an alginate impression, under certain lighting conditions, may look like the photograph of a plaster cast until the descriptive legend is read. Thereafter, it will be seen correctly, and it may even be difficult to see it again as a plaster cast.

According to Luckiesh,² "Illusions are sometimes called 'errors of sense' and some of them are such, but often they are errors of the intellect. The senses may deliver correctly but error may arise from imagination, inexperience, false assumptions, incorrect associations and the recency, frequency and vividness of past experience. The gifts of sight are augmented by the mind with judgments based upon experience with these gifts."

The mechanisms by which illusions are produced are not well understood, but authorities agree fairly well upon certain principles by which the difference between the objective subject matter and the subjective impression may be predicted. For the purposes of this discussion, the physiologic and psychologic causes of illusions are of less importance than the circumstances which produce them. Therefore, this article will emphasize the latter.

Illusions are everywhere. Some are intentional, as in hair styling to change the contour or proportions of the face and neck, or in the design of clothing to de-emphasize excessive thinness or stoutness. Many are not only unintentional, but often are not recognized. It is the intent of this discussion to bring about an awareness of some unwanted illusory phenomena which directly influence the quality of orthodontic practice.

REVIEW OF THE LITERATURE

Although much has been written by psychologists, designers, artists, and others on the theory and application of illusions, the dental and orthodontic literature is almost barren on the subject. Pilkington³ brought out some methods of minimizing abnormalities, particularly in restorative dentistry and partial prosthetics. Blancheri⁴ presented an interesting and ingenious system of reshaping slightly crowded and rotated anterior teeth to create an illusion of normal alignment. Of particular interest was the reorientation of specular reflections or highlights on the labial surfaces of rotated teeth to give them the appearance of normal proximal contact.

MATERIALS AND METHODS

Because the subject of this article is wholly subjective in nature, it does not lend itself to controlled experiment or other accepted research methods; nor can its significance be verified by statistical analysis. Each reader must judge for himself whether—and to what extent—he is led astray in practice by the illusions presented, all of which have been apparent to others than myself, some within the profession and some without dental or orthodontic training.

Although this presentation might be called a study in unintentional deception, I can assure you that every precaution has been taken to avoid distortion in the production of the illustrations. Lenses were chosen for their excellent correction of aberration, camera-to-subject distances were carefully measured and of adequate length to minimize distortion, and subjects were accurately oriented with the optical axis. The straight line and arch drawings were made geometrically.

The subject will be presented by giving for a limited number of categories the principle involved, a classic illustration, the orthodontic application and, where indicated, suggestions for minimizing errors in judgment.

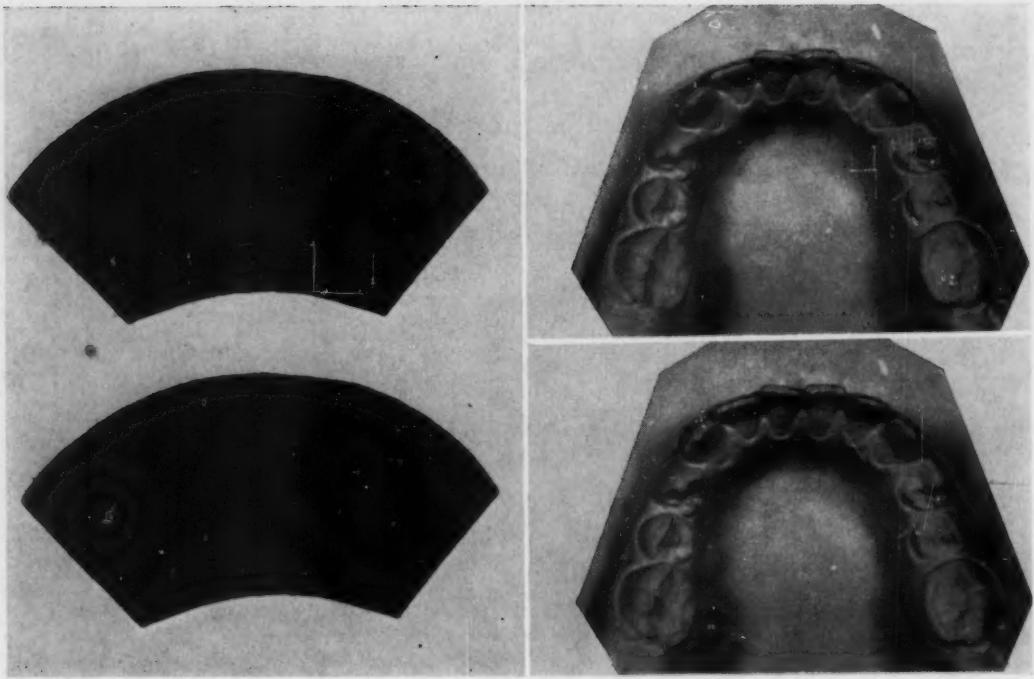
ILLUSORY PHENOMENA

1. Most common among the illusions involving stimuli alone is the larger appearance of a light object as compared with a dark object of identical size and shape (Fig. 1, A). As applied to orthodontics, large incisors will appear larger when they are exposed to full light, as in bimaxillary protrusions. If a choice of treatment plans is possible, these teeth should be retracted to a position where they will be darkened by the shadow of the lips and thus appear more normal in size.

2. In viewing two or more objects with similar contour there is a tendency to judge their size by comparing the adjacent sides of the objects. Thus, in Fig. 2, A, the upper unit appears smaller because it has the smaller of the two adjacent sides. For the same reason, visual comparison of two plaster denture reproductions, if the bases are trimmed with oblique sides, will lead to the same illusion if held one above the other. This is illustrated in Fig. 2, B, where the upper cast appears larger because its back adjoins the front of the lower cast. The illustration is made up of two identical prints from the same negative.

Trimming of casts with parallel rather than oblique sides might partially overcome this tendency of illusion, but would lead to other illusions which will be explained in the following section.

3. The apparent direction of a line is affected by intersecting or neighboring nonparallel lines, acute angles appearing greater and obtuse angles appearing lesser. That is, we tend to perceive all angles as more nearly approaching right angles. In Fig. 1, D the horizontal lines are actually straight and parallel but seem to be curved. The wavy ring in Fig. 3 is a perfect circle and the superimposed figure is a perfect square.



A.

B.

Fig. 2.—*A*, The two crescents are identical. The upper one appears smaller because it has the shorter of the adjacent sides. *B*, The upper dental arch appears wider because that cast has the longer of the adjacent borders. This illustration is made up of two identical prints from the same negative.

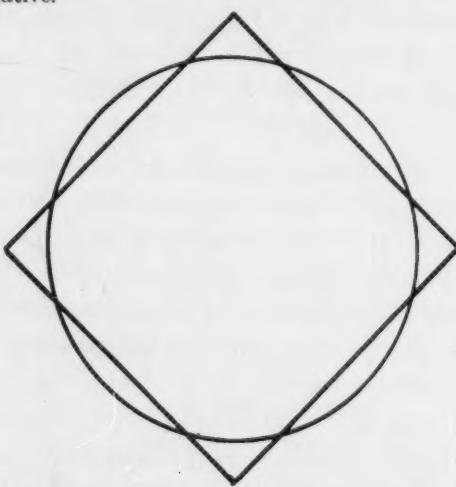


Fig. 3.—Distortion of contour. The wavy ring is actually a perfect circle. The superimposed figure is a perfect square.

Applied to orthodontics, this is obvious in Fig. 4, *A*, in which the identical dental arch appears narrower in the canine region because of the acute angle between the side of the cast and the adjacent row of teeth, as compared with Fig. 4, *B*, in which the sides of the cast are trimmed approximately parallel with the line of the buccal teeth.

The same principle applies in the trimming of the anterior portion of casts. Traditionally, upper casts have been formed so that the front of the

base comes to a point in the midline. As compared with a cast in which the front is trimmed perpendicular to the midline (which would also produce illusions) or in a symmetrical curve which approximately follows the curve of the dental arch (which would minimize the tendency to illusions), the pointed base appears to flatten the arc formed by the anterior teeth.

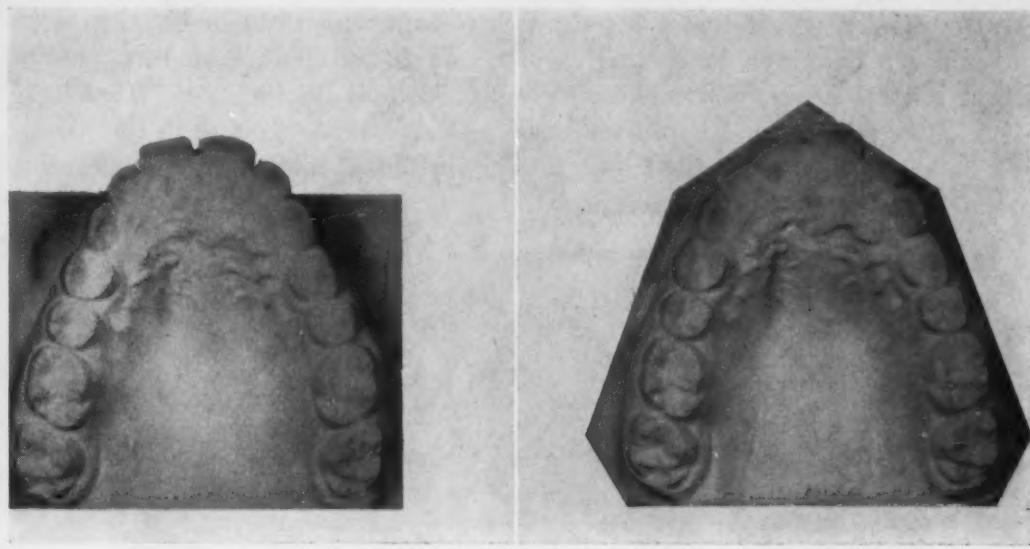


Fig. 4.—Distortion of contour. The apparent form of the dental arch is affected by intersecting, divergent, or parallel lines.

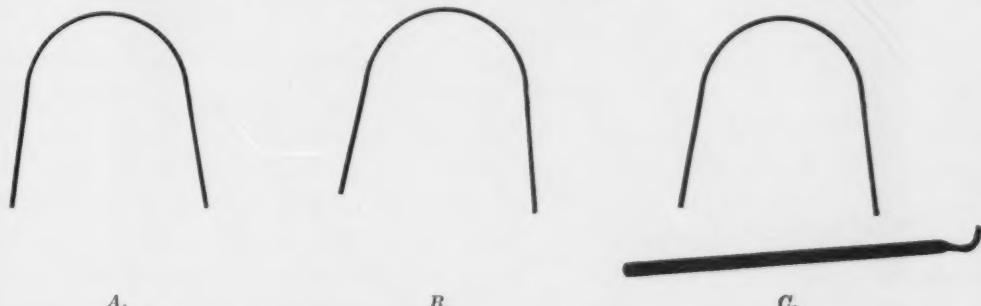


Fig. 5.—Distortion of symmetry. The arches are symmetrical and identical. *A*, Correctly oriented, the arch appears symmetrical. *B*, Slightly rotated, the arch appears asymmetrical. *C*, Correctly oriented but with a distracting object nearby, the arch appears slightly asymmetrical.

For the experienced orthodontist who has trimmed his casts consistently and accurately, and who has thus conditioned his judgment to the viewing of casts against his own particular frame of reference, a change in the outline of his casts would probably prove more disturbing than to continue with his present method. For the beginner or the man who has trimmed his casts indiscriminately, however, it is suggested that he adopt a definite, logical, symmetrical pattern which will minimize illusions and lead to sounder judgment of form, both in the normal and in the abnormal.

Just as the judgment of the form of the dental arch is distorted by the angle of the margins of the casts, the symmetry of an arch wire seems affected by an object lying near it at an odd angle. In Fig. 5, a symmetrical arch form was photographed (*A*) and an "instrument" was then added without changing the photographic setup (*C*). Note the apparent distortion of the arch form.

4. Very similar to the foregoing illusion, for our purposes, is that produced by the tendency to relate a form to a base line, which can be either real or imaginary. The arch forms in Fig. 5, *A* and *B* are identical and symmetric. That in *A* is correctly oriented with respect to these lines of type. That in *B* is slightly rotated, and appears to have lost its symmetry, both in the length of its sides and the form of its anterior portion, because we subconsciously relate it to the symmetry of this page.

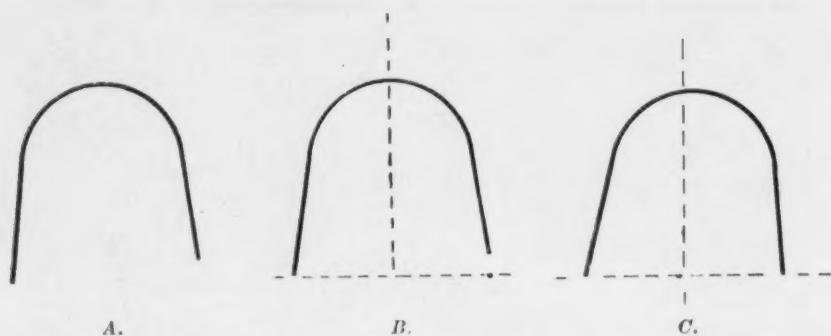


Fig. 6.—Imaginary lines of reference. The arches are identical, and symmetrical except that the right end has been shortened. Correctly oriented (*A*), the arc appears symmetrical since it is related (*B*) to imaginary horizontal and vertical reference lines. Unoriented (*C*), the arc appears asymmetrical, the ends of the arch determining the imaginary reference lines.

Fig. 6, *A* shows the same symmetrical arch with the equivalent of 3 mm. of the right end removed. The symmetry seems to be slightly distorted, the "eupisp" curve being perceptibly flattened on the viewer's left and accentuated on the right. This apparent distortion is minimized because the arch is correctly oriented and is therefore related to imaginary vertical or horizontal base lines, as indicated in Fig. 6, *B*. However, if this arch were unoriented, as in shaping an arch wire at the chair, the operator would tend to relate the form of the arch to a base line through its ends, resulting in the apparent distortion shown in Fig. 6, *C*. Therefore, in actual practice, assuming that symmetry of the dental arch is desired, the molar attachments should be accurately placed mesiodistally in order to provide for equal length in the buccal segments and thus for a symmetric appearance of the arch wire. If symmetry of the arch wire is not desired, as in the case of unilaterally extracted or missing teeth or where basal bone is asymmetrical, a completely symmetrical arch wire should be made first and then the compensatory deviations made according to the treatment plan.

A very prevalent set of illusions is produced when the bases of dental casts are trimmed inaccurately so that false base lines are provided. In Fig. 7, *A* we see either an oblique distortion of the mandible or a functional shift to the

left as a "convenience bite." The maxillary arch is approximately symmetrical except for the buccoversion of the left first permanent molar. In Fig. 7, *B* we see a rather well-developed, symmetrical mandibular arch; the maxillary left buccal segment is in marked mesioversion, assuming that the right buccal segment is in more normal position; the maxillary arch is contracted in the left canine and premolar areas and the incisors are deviated to the right.

I presume that you have surmised by now that these are duplicate casts of the same case with the bases trimmed differently. In Fig. 7, *A*, the posterior surfaces of the casts are correctly trimmed perpendicular to the posterior two-thirds of the median raphe of the palate with the teeth in functional occlusion, the lateral surfaces are trimmed equidistant from the median raphe, and the

A.



B.

Fig. 7.—See text for explanation.

remainder of the bases are symmetrical with respect to the same reference line. The posterior two-thirds of the median raphe is the reference line of choice because, of all the structures represented on the plaster casts, it is farthest removed from and least subject to displacement by environmental pressures.

In Fig. 7, *B* the posterior and lateral surfaces are trimmed equidistant from the mandibular first permanent molars, a method which accomplishes nothing except an attempt at artificial symmetry in the lower cast. It is of interest to observe that in the example shown here there is a rotation of

only 3 degrees in the orientation of the anatomic portions with respect to the bases, but the apparent deviations from normal (and, therefore, the presumed diagnoses) are radically different.

If, as it should, the diagnosis leads to a treatment plan, the outcome of this case would be profoundly affected by the analysis made from one or the other of these two sets of casts, depending entirely upon the base line to which the dental arch forms are related.

An interesting instance, in which a well-chosen line of reference led to a debatable conclusion, may serve as a warning against relying too heavily upon *any* base line. Fig. 8, A appeared in an article by Björk⁵ and represents the most prognathous and the most retrognathous of the Bantus studied by him.

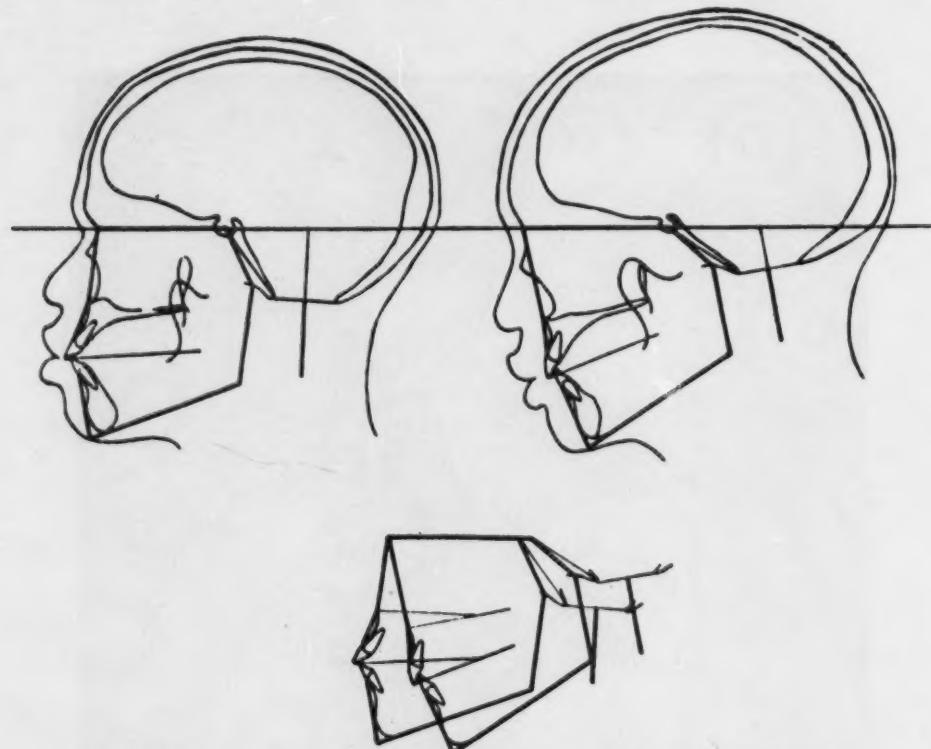


Fig. 8.—A, Maximum and minimum facial prognathism in adult male Bantus, using nasion-sella as line of reference. (From Björk: *Angle Orthodontist*, January, 1951.)

Let me state here that I have the highest regard for Björk as a sincere, able researcher, and that nothing said or implied here should be taken as derogatory. It is rather to be considered as a compliment that he is a warm, human person and, as such, is subject to the same illusions that deceive us all. His statement about these two Bantu is correct if we accept prognathism and retrognathism as certain relations of the lower face to the sella-nasion plane which he uses as a plane of reference in his studies.

But let us examine these tracings a little further. The individual tracings were photographed under identical conditions and positive prints were made on sheet film. The print of the prognathous Bantu (Mr. Prog, for short) was

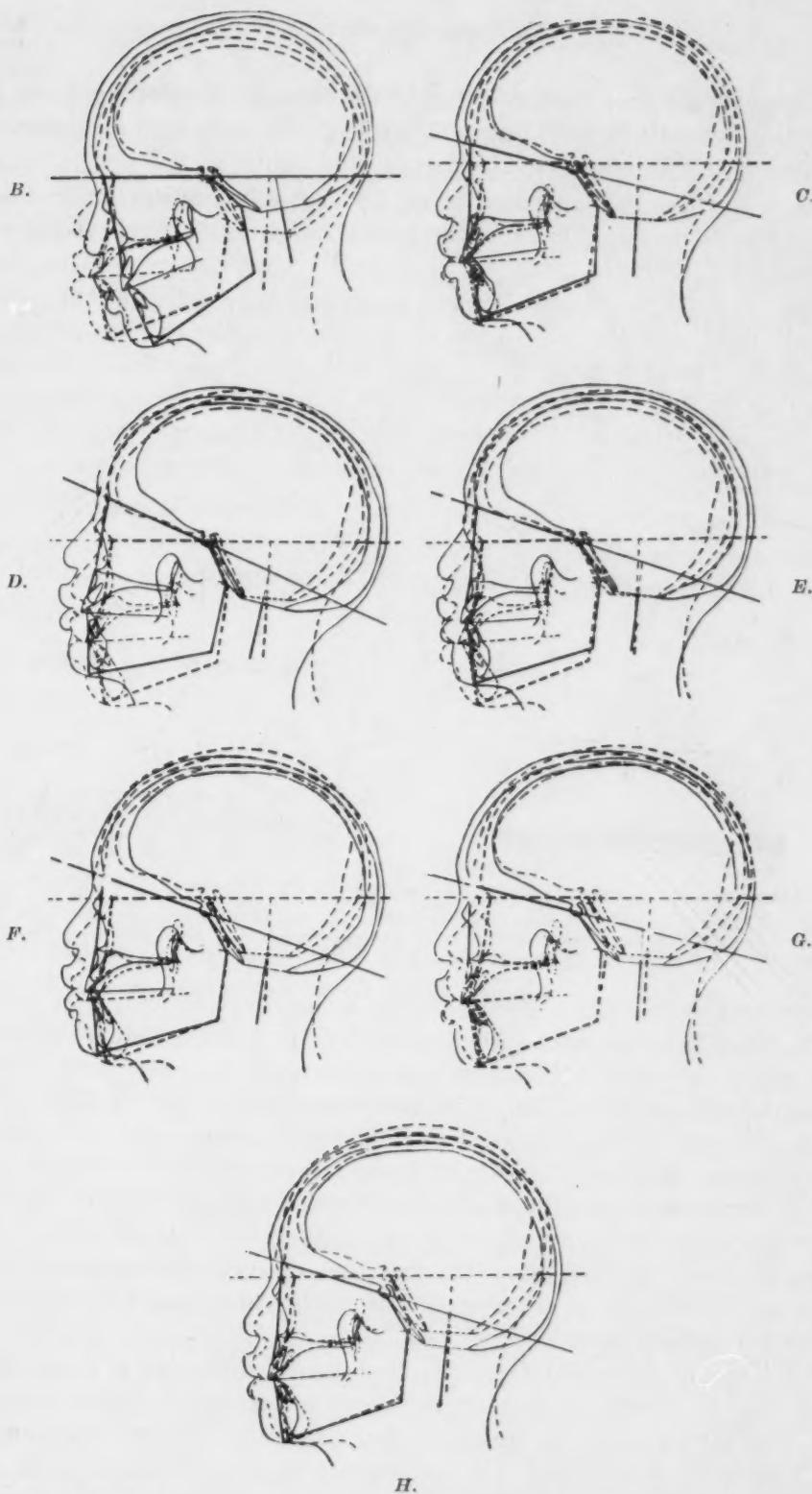


Fig. 8.—*B* through *H*. Superposition on various reference lines. The "most prognathous" is shown in broken lines, the "least prognathous" in solid lines. *B*, Nasion-sella with sella registered. *C*, Head balance axis. *D*, Sella-articulare with sella registered. *E*, Sella-basion with sella registered. *F*, Articulare-gonion with gonion registered. *G*, Gonion-gnathion with gonion registered. *H*, Occlusal plane with its intersection with articulare-gonion registered.

knife-etched to produce broken lines and the print of the retrognathous Bantu (Mr. Retro) was left in solid lines. The two prints were then superimposed in various ways and photographed by transmitted light.

Fig. 8, *B* shows the superposition on NS with sella registered. In this comparison there is no question as to the prognathism of Mr. Prog and the retrognathism of Mr. Retro.

Some similarity in the profiles was noted and, with the idea that posture of the head might give the impression of prognathism, the prints were superimposed on the "head balance axis," the perpendicular bisector of the foramen magnum (Fig. 8, *C*). Thus compared, the difference in prognathism is practically nil, the principal differences between the tracings being the slightly smaller cranium in Mr. Prog and the marked deviation of the NS lines.

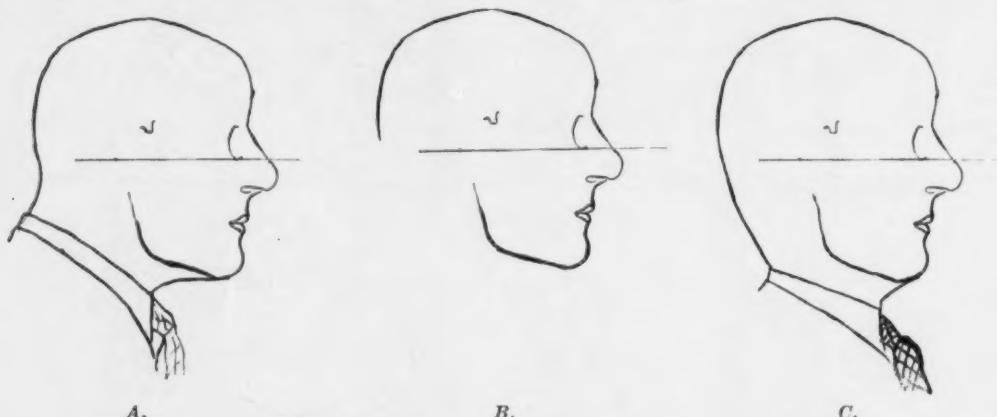


Fig. 9.—The face and cranium (*B*) are identical in all three drawings. The addition of a heavy neck (*A*) gives the impression of prognathism. The addition of a slender neck (*C*) gives the impression of retrognathism.

Further superpositions were made on sella-articulare with sella registered (Fig. 8, *D*), sella-basion with sella registered (Fig. 8, *E*), articulare-gonion with gonion registered (Fig. 8, *F*), gonion-gnathion with gonion registered (Fig. 8, *G*), and the occlusal plane with its intersection with articulare-gonion registered (Fig. 8, *H*). In all these comparisons Mr. Prog appears to be less prognathic than Mr. Retro. Furthermore, Fig. 8, *F* and *G* would suggest (although the condyles are not shown) that there is little difference between these two persons in the size and shape of the maxillae and mandibles. The important factor in this analysis of these two tracings is the fact that the greatest difference is in the position of the NS line in all comparisons except, of course, that in which the NS lines were superimposed.

The illusions of prognathism and retrognathism were a result of "the recency and frequency of past experience"²² in relating forms to a base line which, like all parts of the human body, may vary between individual persons. That Björk is aware of this deviation of the entire head from the normal relation to the NS plane (which is another way of saying that there is variation in the NS plane) is evidenced by his description⁶ of the rotation of the cranium which is correlated with prognathism and retrognathism and of the postural differences in prognathic and retrognathic persons.

5. An illusion somewhat similar to that just described is shown in Fig. 9, which was also made by photographing superpositions by transmitted light. The basic element (Fig. 9, B) is a cranium and face which appears to be an average person exhibiting neither prognathism nor retrognathism. The addition of a neck (Fig. 9, A) produces a definite impression of prognathism which, through our daily observations of people, we have come to associate with a "bull-neck." With the addition of a neck (Fig. 9, B) the retrognathic appearance is quite noticeable to us, because we have noticed that retrognathism and a slender neck are often companion characteristics. In this illusion we "see" what we expect to see or what we think we should see, and almost unavoidably are aware of some connotations which may be entirely false. For example, the profile with the thick neck "looks" aggressive and the profile with the slender neck "looks" indecisive.

By viewing profile and full-face photographs upside down, these distracting connotations are eliminated and the actual form of the face can be studied to better advantage.



Fig. 10.—Interrupted extents. The interrupted figures appear longer than the equal uninterrupted figures.

Of the almost limitless number of illusions which affect our judgment in daily practice, I will call attention to only a few more.

1. The appearance of correct intercuspalion of premolars and molars when one looks diagonally into the mouth. When, from such a viewpoint, the tip of the buccal cusp of a maxillary premolar is lined up with the embrasure in the mandibular arch, the upper cusp is actually 2 or 3 mm. mesial to its apparent position because of its more buccal location. This has been described in detail by Stoller.⁷

2. The inability to judge arch form in the mouth unless the observer places himself in an extension of the patient's midsagittal plane. This point needs no elaboration.

3. The tendency to judge the long axis of a rotated tooth as comparable to the long axis of the labial or buccal surface of the crown. Because of the lingual inclination of the long axis of the tooth with respect to the labial or buccal surface, it appears to lie more in the direction toward which the labial or buccal surface is rotated than is actually the case.

4. The principle of "interrupted extents."⁸ A row of dots appears to occupy a greater extent than the same empty distance between two

dots, and a line interrupted by crossbars seems longer than the same line without crossbars (Fig. 10). Thus, for example, if the deciduous canine and premolars are lost on one side of a dental arch, the space between the first permanent molar and lateral incisor appears shorter than the comparable space occupied by teeth on the opposite side of the arch. Actual measurement can, of course, be relied upon.

SUMMARY

The prevalence, unavoidability, and importance of illusory phenomena have been discussed. A few specific examples have been shown to illustrate general principles. No attempt has been made to analyze the extent or degree of distortion in perception or impression, since the error is entirely subjective, not measurable, and may vary with the individual observer.

Illusory phenomena are perfectly normal responses to given stimuli and should not be considered wrong, stupid, or careless. They should not, however, be ignored.

CONCLUSIONS

If the practicing orthodontist were to avoid the consequences of all undesirable illusions he would spend an inordinate amount of time measuring, checking symmetry, and so forth. By developing an "illusion-mindedness," he can avoid many errors of judgment.

On the other hand, he may wish to create desirable illusions. This subject in its application to orthodontics requires further investigation.

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Orthodontic Profiles

ROBERT DUNN

THE first man on the Pacific Coast to limit his practice to orthodontics was Dr. Robert Dunn. It might also be stated by those who knew him well that he was a highly skillful practitioner and, as a pioneer, set high standards for those who were to follow.



ROBERT DUNN

He was born in Monmouth, Illinois, on March 22, 1872, and took his dental training in the Colorado College of Dental Surgery in Denver, graduating in 1898. He attended the spring session of the Angle School in 1902 and opened his office in San Francisco in the fall of the same year. Like many worth-while

and successful men, he found it necessary to work his way through college. Soon after his graduation he married Eleanor Benedict and of this union six children were born, three boys and three girls, all of whom are still living.

Soon after Dr. Dunn became established in San Francisco the disastrous fire and earthquake of April, 1906, occurred so that, along with many others, he found life pretty rugged for a number of years. During this period he moved his family across the bay to Oakland and remained there until the time of his death in September of 1937.

Because of the fire and earthquake, he continued having an office in both San Francisco and Oakland so that all of his patients could receive his care without interruption.

He was one of the organizers of the Pacific Coast Society of Orthodontists which had its origin in the spring of 1913. He served as its first president and was always a very active member as long as he lived.

In his practice he believed that no case was completed until all of the teeth were brought into normal occlusion. He felt that this must include establishing a normal overbite and balance of all of the teeth and, in order to do this, he used to state that one of the keystones of success was gaining adequate vertical development in the lateral segments of the opposing teeth, especially where the bicuspids were involved. Because he advocated this principle so unremittingly, some of his close friends used to tease him in a good-natured way and nicknamed him "Old Vertical Development." However, he could hold his own in any argument and prove his contentions by the results he obtained.

He had two hobbies, the principal of which was gardening. In this he was very successful; he maintained his own greenhouse in which he grew all of his plants from seed and thoroughly enjoyed it. The lesser hobby was golf, which he shared with his son, J. Elliott Dunn, now in orthodontic practice in Oakland.

All orthodontists upon the Pacific Coast should be grateful to Dr. Robert Dunn who, in his pioneering, set high standards for future orthodontists to follow.

James D. McCoy.

**Plan Now to Attend
1958 Meeting**

**American Association of Orthodontists
Commodore Hotel, New York City
April 27-May 1, 1958**

On page 69 you will find an announcement concerning registration of members, associate members, and guests. Please read it carefully and act immediately.

Reservations for rooms should be sent directly to the Commodore Hotel, New York City. A full program of entertainment for the ladies has been prepared. New York is waiting for you.

Editorial

THE CONSUMERS REPORT

MOST people know about the business magazine, *Consumers Report*. This periodical makes analytical reports on the relative merits of various products, such as automobiles, appliances, television sets, etc. Recently the periodical has made some limited reports about services, including some divisions of the health services.

The most recent health service to be spotlighted by *Consumers Report* is a comparatively new but rapidly growing specialty of dentistry, known officially as orthodontics. It is interesting to note the observations of *Consumers Report* and to see how the report goes on to portray the merits and demerits of a health service and at the same time to by-pass the usual routine washing-machine or air-conditioner type of appraisal, in which a comparison of brand names is the usual routine.

These reports are claimed by the magazine to be unprejudiced, and ratings are determined by tests, examination, or use as well as by the studied opinions of qualified authorities in the particular field being explored. *Consumers Report* for September, 1957, calls attention for instance to the "uninformed viewpoint that orthodontia is concerned only with straightening the teeth to improve the appearance and that cost becomes an over-riding consideration."

It goes on to say, however, that "improving the appearance is indeed one of the aims of orthodontic treatment, but modern orthodontia is primarily preventive dentistry, designed to promote better health of the mouth, and to correct misalignments that eventually may cause serious disease of the teeth and gums. Regularly aligned teeth are more easily kept clean than overcrowded or tilted ones. They are less apt to retain food particles, and thus less likely to decay. Malocclusion (or bad alignment) of the teeth causes improper distribution of stresses upon the bones and gums, which is a primary cause of destructive pyorrhea in later life. Preventive orthodontia then seeks to avoid the long and expensive care required to correct early neglect."

The above quotation plainly reflects the "improve the appearance" or cosmetic perspective of many laymen, notwithstanding that is quickly offset by the health service benefits that the specialty likes to think at least is a very important product of the treatment. The report, while in the main revealing in its over-all appraisal of the specialty, nonetheless is somewhat careless about correct terminology. For instance, the report is said to be about "orthodontia." However, the correct name of the specialty is orthodontics, as attested by no

less authorities than the leading medical dictionaries, the American Association of Orthodontics, the American Dental Association, the AMERICAN JOURNAL OF ORTHODONTICS, and leading dental schools.

It is not at all difficult for the layman to get the over-all impression from the report that many specialists "prefer to arrange a contract for their services before beginning a full course of therapy and to many families this may come as a jolt." The author, however, again more or less tempers this contract theme by saying that the ultimate benefits can be great and that the cost is best measured perhaps against that consideration.

Quite to the contrary, it is obvious that formal legal contractual relations between doctor and patient in any type of health service are rare for the obvious reason that health service contracts are regarded, by and large, as not being in step with the problem at hand. The problem at hand is construed to be one of many intangibles not in tune with the usual concept of contracts, torts, and Blackstone.

Many specialists, however, do send memoranda to parents plainly for the purpose of correlating the thinking of parents as to the treatment; such a memorandum can in no sense be regarded as a contract, and it is usually called and thought of only as a form letter.

There are other quotations from the *Consumers Report* articles that convey considerable information to the laymen, for instance: "The results of orthodontic treatment are theoretically permanent; if it's properly done and carried through, there should be no relapse. There are, however, certain limitations to treatment, and their recognition is important to success. There must be complete cooperation. The patient must follow meticulously the instructions of the orthodontist as to the care of appliances, the wearing of elastics and retainers in the prescribed manner, and the overcoming of undesirable habits which can cancel the good effects of treatment. The family dentist usually has enough training to do simple corrections; if an orthodontic specialist is required the family dentist is also the logical person to do the recommending."

All in all, the *Consumers Report* did a good job of reflecting the merits of orthodontic treatment, notwithstanding the fact that it overlooked the correct and accepted name of the specialty and perhaps mistakenly used the word "contract" when it meant "memorandum." One thing is certain: The report helps to emphasize the observation, often heard among specialists in orthodontics, that if the second sixty years of orthodontics creates as good a record as the first sixty years, orthodontics will not obscure its record from the spotlight.

H. C. P.

In Memoriam

ORVILLE VAN DEUSEN

1868-1957

ORVILLE VAN DEUSEN died on Aug. 17, 1957, after a brief illness. Dr. van Deusen was born Nov. 13, 1868, at Herndon, Virginia, the son of the late William A. van Deusen and Mary Hitchens van Deusen.

He attended local schools and Strayer Business College in Washington, D. C. After working at business positions for several years in Washington, he entered Columbia University School of Dentistry and graduated in June, 1898. After graduation, he worked for a time as a contract dentist at Camp Alger, Fairfax County, Virginia. Later in the same year he opened an office for the practice of dentistry in Front Royal, Virginia. In 1932 he attended the Dewey School of Orthodontia and began the exclusive practice of orthodontics in Winchester, Virginia. He retired in 1954.

Dr. van Duesen was a member of Calvary Episcopal Church in Front Royal, Virginia, where he served as vestryman for many years. He was a Mason, and was active in civic affairs. His membership in dental organizations was as follows: Virginia State Dental Association (president, 1946-47), Shenandoah Valley Dental Society—Component No. 7—(president, 1917), Washington-Baltimore Society of Orthodontists, Southern Society of Orthodontists (vice-president, 1947-48), and American Association of Orthodontists.

He is survived by his wife, Adelaide Overton van Duesen, one son, two grandchildren, one brother, two nephews, and a niece.

Department of Orthodontic Abstracts and Reviews

Edited by

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Abstracts Presented Before the Research Section of the American Association of Orthodontists, New Orleans, May, 1957

Some Practical Psychological Considerations in Orthodontic Practice: By George W. Huckaba, B.A., D.D.S., University of Tennessee, College of Dentistry, Memphis, Tennessee.

One of the primary essentials of orthodontic practice was recognized to be the ability of the practitioner to make his services available to the patient through a well-established relationship. The orthodontist must apply his management techniques before he becomes well enough acquainted with his patients and their parents to classify them accurately.

First impressions were considered to be enduring. Office décor, cordiality on the part of the receptionist, and friendliness on the part of the orthodontist were considered to be of first importance.

Methods of fee presentation were considered. An initial fee payment followed by monthly installments for the duration of active treatment appeared to be the method of payment most popular with the parents and most practical for the orthodontist. Treatment procedures and fees involved in each case were outlined briefly and explained to both parents.

The conduct of treatment presented problems in patient cooperation in the matter of keeping appointments, care of appliances, and the wearing of elastics and other treatment adjuncts. In general, these problems were met by gaining the interest of the patient in the progress of his treatment and by making him feel that he was a partner in the enterprise. The appeal for parent cooperation was made chiefly through the suggestion that lack of cooperation tends to prolong treatment and thus increases the fee.

Since parents who are well pleased with the results of treatment are acknowledged practice builders, their good will was solicited by correspondence which pointed out the beneficial results of treatment.

The Pressure Exerted on the Maxillary and Mandibular Central Incisors by the Perioral and Lingual Musculature in Acceptable Occlusion: By Fred W. Sims, B.S., D.D.S., University of Tennessee, College of Dentistry, Memphis, Tennessee.

In a study group comprising twenty-one male subjects who possessed superior to excellent occlusions, the pressures exerted on the maxillary and mandibular central incisors by the perioral and lingual musculature were computed.

The apparatus used to measure the pressures was a converted electrocardiograph in which the galvanometer had been replaced with an optical manometer.

Recording bulbs, made of self-curing latex and attached to the system by means of a polyethylene tube, were employed to register intraoral forces.

Three areas were selected for recording pressures: labial of the maxillary central incisor, labial of the mandibular central incisor, and lingual of the central incisors at the level of occlusion. Pressure recordings were obtained in each of the three areas with the teeth in centric occlusion, then during swallowing, and finally with the teeth in rest position.

From the data, the arithmetic mean, standard deviation, standard error, and the range were calculated.

It was observed that the tongue exerted from four to fifteen times the pressure of the labial musculature during swallowing.

The labiolingual axial positions of the maxillary and mandibular central incisors were measured from lateral headfilms, and these angles were correlated with the labial muscular pressure exerted and then with the lingual muscular pressure exerted. Insignificant coefficients of correlation were obtained in all cases, suggesting that the labiolingual axial positions of the incisor teeth were not governed in any predicable fashion by the perioral and lingual musculature.

A Survey of Some Commercial Adhesives: Their Possible Application in Clinical Orthodontics: By John F. Sadler, D.D.S., University of Tennessee, College of Dentistry, Memphis, Tennessee.

The purpose of this investigation was to analyze the several commercial adhesives now available that may be used in clinical orthodontics. The adhesives were tested to determine the possibility of bonding metal attachments directly to the teeth and eliminating the bands completely.

Nine preparations were studied. These included four dental cements, one rubber-base cement, two metal adhesives, and two general adhesives.

Edgewise brackets were bonded to extracted human teeth with each preparation. After the brackets had been bonded to the teeth with each preparation, tension, shear, and torque force was applied to the brackets. The intensity of force was gradually increased on each bracket until the bracket was dislodged. At this instant the amount of force being applied was recorded.

The forces of tension and shear were recorded in grams, while torque force was recorded in grams and centimeters. For the most part, the adhesives surveyed showed a lack of adhesion to the metal brackets. In their present state, none of the adhesives tested were capable of bonding metal attachments directly to the teeth with a stability required for clinical orthodontics.

The Relationship of Marked Mandibular Arch Asymmetry and the Ability to Perform Certain Unusual Tongue Movements: By Harold R. Wooldridge, B.S., D.D.S., University of Tennessee, College of Dentistry, Memphis, Tennessee.

This study was initiated in an attempt to ascertain the relationship, if any, that exists between marked asymmetry of the mandibular dental arch and the ability to perform certain tongue movements. The tongue movements studied are: rolling the lateral edges, folding back the tip, and twisting so that the sides of the tongue are superiorly and inferiorly placed.

Tongue movement abilities of 564 persons who comprised the study group were observed clinically. In cases of marked asymmetry of the mandibular dental arch impressions were taken and plaster models were made. The direction of the asymmetry was noted.

No sex difference in any of the tongue movements studied or in the incidence of marked asymmetry that existed was observed. Of the 564 persons 3.01 per cent could roll and fold the tongue; 70.74 per cent could roll but not fold the tongue; 26.24 per cent could neither roll nor fold the tongue. No one was found who could fold but not roll the tongue. Of the group, 27.48 per cent had asymmetrical arches. No relationship existed between the ability to roll, fold, or twist the tongue both ways and asymmetry of the mandibular arch. In those persons who could twist the tongue in only one direction, a definite relationship between that ability and asymmetry of the mandibular dental arch existed, provided that the twisting direction and the direction of asymmetry were the same.

It was concluded that the ability to twist the tongue in one direction only and asymmetry of the mandibular arch in the same direction did not come about by chance.

A Radiographic Study of Alveolar Bone Patterns: By E. G. Staffieri, B.S., D.D.S., University of Pittsburgh, Pittsburgh, Pennsylvania.

Purpose.—The purpose of this study was to determine if there were different arrangements of the trabeculae in the alveolar bone of the mandible and maxilla and if these differences would contribute to a better understanding of bone reactions during orthodontic treatment.

Methods and Materials.—Radiographs of the mandibles of more than 100 dry skulls were studied to determine if different patterns existed. Because the posterior portion of the body of the mandible is more suitable for radiographic study, due to its shape and angulation, it was selected as the site from which to ascertain the alveolar bone pattern of the individual. To corroborate the radiographic and actual physical appearance of the cancellations, mandibles representing each of the bone patterns were sectioned, visually examined, and then compared with the radiographic bone patterns. No differences were noted from this comparison; thus, the validity of the radiographic patterns was in evidence. For descriptive purposes, the patterns were termed round, transverse, and irregular.

The round alveolar bone pattern showed an abundance of uniform size and shape of the cancellations and an apparent constant quantity of calcium salts, as judged by the degree of radiopacity or radiolucency of the cancellations.

The transverse alveolar bone pattern was characterized by large rectangular cancellations and a varying degree of calcium salts.

The irregular alveolar bone pattern showed cancellations of irregular shape and size, but with a greater degree of calcium salts. The radiopacity of the bone patterns were, at times, sufficient to obscure the root outline of some of the teeth.

At the present time the intraoral radiographs of over 200 living patients have been viewed and the writer's intention is to view another 200 patients with special emphasis on those radiographs of orthodontic patients before treatment and after treatment.

Findings to Date.—

1. Each person has an inherited bone pattern characteristic to that person.
2. Persons exhibiting a transverse bone pattern, excluding conditions of systemic disorders directly affecting bone structures, show greater resistance to osteoclasia and periodontal diseases.

3. No significant bone pattern could be attributed to either sex.
4. Though the number of cases is not sufficient at the present time, the greatest number of round bone patterns is appearing in the Mongoloid race and of the irregular patterns in the Negroid race.
5. Despite the local bone changes observed in orthodontic movement or those changes seen in the areas of fractures, extractions, cyst removal, etc., the overall bone pattern did not change and the original pattern characteristic of the individual person eventually manifested itself in those areas of temporary change.
6. One last phase, still under investigation, is the possible correlation of the different types of malocclusions to the various bone patterns.

**Plan Now to Attend
1958 Meeting**

**American Association of Orthodontists
Commodore Hotel, New York City
April 27-May 1, 1958**

On page 69 you will find an announcement concerning registration of members, associate members, and guests. Please read it carefully and act immediately.

Reservations for rooms should be sent directly to the Commodore Hotel, New York City. A full program of entertainment for the ladies has been prepared. New York is waiting for you.

News and Notes

American Association of Orthodontists, 1958 Research Section Meeting

Continuing the policy of recent years, one session of the program of the annual meeting will consist of ten-minute oral reports of research. Items submitted for this program by authors not in attendance may be read by title only. All persons engaged in research are urged to present the results of their studies at this session on April 29, 1958. Commodore Hotel, New York, New York.

Each participant is asked to prepare a 250-word abstract for publication in the AMERICAN JOURNAL OF ORTHODONTICS. Both the abstract for publication and the ten-minute oral report should be carefully prepared to present adequately the import of the investigation.

Forms for use in submitting the title and abstract will be sent to each dental school orthodontic department and to any individual requesting one. Please send the title and abstract as early as possible, but not later than Jan. 10, 1958, to Dr. Herbert I. Margolis, Department of Orthodontics, Tufts University School of Dental Medicine, 136 Harrison Ave., Boston 11, Mass.

Thomas D. Speidel, Chairman, Research Committee
School of Dentistry, University of Minnesota
Minneapolis 14, Minnesota

1958 Milo Hellman Research Award, American Association of Orthodontists

The annual prize essay contest of the American Association of Orthodontists is to be known henceforth as the Milo Hellman Research Award, by action of the Association at its 1957 meeting.

Eligibility.—Any member of the American Association of Orthodontists and any person affiliated with a recognized institution in the field of dentistry or associated with it as a teacher, researcher, undergraduate, or graduate student shall be eligible to enter the competition.

Character of Essay.—Each essay submitted must represent an original investigation and contain some new and significant material of value to the art and science of orthodontics.

Prize.—A cash prize of \$500.00 is awarded for the essay judged to be the winner. The committee reserves the right to omit the award if, in its judgment, none of the entries is considered to be worthy. Honorable mention is awarded to the authors taking second and third places. The first three papers will become the property of the American Association of Orthodontists and will be published. All other essays will be returned to the authors.

Specifications.—All essays must be in English, typewritten on 8½ by 11 inch white paper, double spaced with at least 1 inch margins. Each sheet must be numbered and bound or assembled firmly in a "brief cover" for easy handling. The title of the essay should appear on the "brief cover." Three complete copies of each essay, including all illustrations, tables, and bibliography, must be submitted. The name and address of the author must not appear on or in the essay. For identification of the essay, its title, its author's name, and a brief biographical sketch setting forth the author's professional training, present activity, and status (practitioner, teacher, student, research worker) must be typed on a separate sheet of paper and enclosed in a plain envelope. The title of the essay only must appear on the envelope.

Presentation.—The author of the winning essay will be invited to present it at the meeting of the American Association of Orthodontists to be held in New York, New York, April 27 through May 1, 1958.

Judges.—The entries will be judged by the Research Committee of the American Association of Orthodontists.

Final Submission Date.—No essay will be considered for this competition unless received in triplicate on or before Jan. 10, 1958, by Dr. William B. Downs, 314 North Lake St., Aurora, Illinois.

Thomas D. Speidel, Chairman, Research Committee
School of Dentistry, University of Minnesota
Minneapolis 14, Minnesota

American Board of Orthodontics

The next meeting of the American Board of Orthodontics will be held at the Commodore Hotel in New York, New York, April 22 through 26, 1958. Orthodontists who desire to be certified by the Board may obtain application blanks from the Secretary, Dr. Wendell L. Wylie, University of California School of Dentistry, The Medical Center, San Francisco 22, California.

Applications for acceptance at the New York meeting, leading to stipulation of examination requirements for the following year, must be filed before March 1, 1958. To be eligible, an applicant must have been an active member of the American Association of Orthodontists for at least two years.

American Association of Orthodontists

Registration of Nonmembers for Attendance at Annual Session

To insure full participation of all active members of the American Association of Orthodontists, the following classification of nonmembers eligible to attend and schedule of attendance fees, which will be charged at the time of registration, has been set up for the coming annual session of the Association at The Hotel Commodore, New York City, April 27 to May 1, 1958.

A. No Attendance Fee.

1. Full-time teachers in university dental schools.
2. Full-time graduate or postgraduate students in university orthodontic departments. It will be necessary to present a letter from the dean of the school certifying the status of the student.
3. Dentists from outside Canada or the United States of America who are members of recognized dental or orthodontic organizations.

B. Attendance Fee—\$10.00.

1. Associate or junior members of constituent societies of the American Association of Orthodontists.
2. Recent graduates of university orthodontic departments who are in Government Service.

C. Attendance Fee—\$20.00.

1. Recent graduates of university orthodontic departments who are not members of constituent societies of the American Association of Orthodontists.
2. Other guests.

Those persons who would be classified under the heading of C-1 or C-2 above are requested to apply to the chairman of the Credentials Committee at least sixty days before the session for proper forms, which will require (a) written endorsement by two active members of the A. A. O. in the applicant's vicinity, (b) that the applicant be a member in good standing of the American Dental Association, and (c) that the applicant never have been rejected for membership in any of the constituent societies of the A. A. O.

Those persons who would be classified under the headings of A or B would be required only to submit credentials identifying themselves as being in one of these categories at the time of registration. Advanced reservations, which are by far most desirable, can be applied for by clearing one's credentials with the Credentials Committee by March 1, 1958.

Registration under categories C-1 and C-2 will, of necessity, be limited.

C. Sterling Conover
Chairman of the Credentials Committee
1 East 57th St.
New York, New York

American Association of Orthodontists
1958 Annual Meeting

In the great city of New York, the American Association of Orthodontists will hold its annual meeting, April 27 to May 1, 1958, at the Commodore Hotel.



United Nations, East River view. Nestling at the foot of fabulous Forty-second Street are the United Nations buildings, in which the countries of the world seek peace in a very turbulent century. The thirty-nine-story Secretariat Office Building stands impressively over the low-domed General Assembly Building. In the background can be seen the world's two tallest buildings, the Empire State and the Chrysler Buildings. (Courtesy New York Convention and Visitors Bureau.)

American Association of Orthodontists Postconvention Cruise

Arrangements have been made for a delightful eight-day cruise on the "Ocean Monarch" of the Furness Lines to follow the annual meeting in New York City.

All arrangements are in the hands of Dr. C. W. Carrick of Oberlin, Ohio, owner of the Carrick Travel Bureau of that city. Dr. Carrick is the official travel consultant for the U. S. A. Section of Fédération Dentaire Internationale and has taken or sent hundreds of American dentists to these meetings over a period of thirty years.

On investigation, it has been found that this cruise and the ship to be used are ideal. Both Bermuda and Nassau, which will be visited, will be at the peak of their glory, and a marvelous experience will be in store for those who may make this trip.

For information write Dr. Carrick at the earliest possible moment.

Great Lakes Society of Orthodontists

The twenty-eight annual meeting of the Great Lakes Society of Orthodontists was held at the Statler Hotel in Detroit, Michigan, Oct. 20 through Oct. 23, 1957. A brief résumé of the meeting follows.

Sunday, October 20

Get-together for members, wives, and guests.

Monday, October 21

Morning:

Society Breakfast for members and guests. (A complimentary Continental Breakfast for the wives was served at the same time in another part of the hotel.)

Business Meeting:

Invocation. The Rev. Frank J. McQuillan, Detroit, Michigan, a cousin of President Harlow L. Shehan.

President's Address. Harlow L. Shehan. (Dr. Shehan stressed that, although we limit our practice to orthodontics, we are basically dentists and must support in every way possible the training of dentists. He also suggested that the men in private practice are guilty of not writing up cases and observations in the field of orthodontics.)

Secretary's Report. D. C. Miller. (Dr. Miller reported the deaths during the past year of Carl S. Lewis of Pittsburgh, Pennsylvania, and Lester H. Tate of Canton, Ohio. He announced that Russell E. Irish of Pittsburgh has retired from practice.)

Board of Censors Report. Hunter I. Miller, Chairman, read the names of nineteen men accepted into active membership.

Announcement that the Executive Committee had voted to support the International Orthodontic Workshop to be held in Ann Arbor, Michigan, June 15 to 20, 1958. (Participation is by invitation only.)

MATTERS HAVING TO DO WITH THE TWEED TEACHINGS IN ORTHODONTICS. Ben L. Herzberg, Chicago, Illinois.

THE TREATMENT OF BI-MAXILLARY PROTRUSIONS ACCORDING TO TWEED TEACHINGS. Ben L. Herzberg, Chicago, Illinois.

Afternoon:

Society Luncheon for members, wives, and guests.

Tour of General Motors Technical Center, site of GM's central staffs in research, advanced engineering, styling, and manufacturing development.

Evening:

Table Clinics.

Tuesday, October 22

Morning:

AN AID TO TREATMENT PLANNING IN CLEFT PALATE CASES. Herbert K. Cooper, Lancaster, Pennsylvania.

THE CONCEPT OF ATYPICAL EXTRACTION AS RELATED TO DIAGNOSIS. Paul V. Reid, Philadelphia, Pennsylvania.

Afternoon:

Past-Presidents' Luncheon.

DENTAL DEVELOPMENT AND THE CHILD AS A WHOLE. Byron O. Hughes, Professor of Child Development and Director of Child Research, University of Michigan, Ann Arbor, Michigan.

EXTRACTIONS IN THE BORDERLINE CASE: CASE REPORTS. Paul V. Reid, Philadelphia, Pennsylvania.

THE USE OF LABIAL-LOOP-LINGUAL APPLIANCES IN DIFFERENT TYPES OF CLASS II CASES. William L. Wilson, Boston, Massachusetts.

Evening:

President's Reception, followed by banquet and dance.

Wednesday, October 23

THE USE OF LABIAL-LOOP-LINGUAL APPLIANCES IN DEFICIENCY CASES WHERE EXTRACTION OR EXPANSION IS INDICATED. William L. Wilson, Boston, Massachusetts.

IT'S LATER THAN IT'S EVER BEEN FOR FINANCIAL SECURITY. M. C. Pedersen, Lincoln, Nebraska.

Final Business Session.

Recognition of general chairman and committee members.

Presentation of official gavel to new president, Edwin G. Flint.

Presentation of framed plaque from Society to Dr. Shehan.

Announcement of next meeting at the Penn-Sheraton Hotel, Pittsburgh, Pennsylvania, Nov. 2 to 5, 1958.

Northeastern Society of Orthodontists

The Northeastern Society of Orthodontists will hold its annual business meeting at the Commodore Hotel in New York City on Tuesday, April 29, 1958. There will be no scientific meeting of the Society, since the American Association of Orthodontists will be meeting in New York at that time.

Pacific Coast Society of Orthodontists

The twenty-fifth biennial meeting of the Pacific Coast Society of Orthodontists will be held in Santa Barbara, California, Feb. 23 to 26, 1958. The program is as follows:

Sunday, February 23
Biltmore Hotel

9:00-12:00 A.M. Registration.

1:00- 4:00 P.M. Golf Tournament.

5:00- 8:00 P.M. Cocktail Party; entertainment, trio, buffet.

Monday, February 24
Biltmore Hotel

Chairman—Wendell L. Wylie:

9:15 A.M. Call to order. President's address. Business meeting.

10:00-11:00 A.M. Essay by Walter J. Straub.
11:00-12:00 A.M. Essay by Allan G. Brodie.
12:15- 2:00 P.M. Luncheon. Address of Welcome by Elmer R. Noble, Provost University of California, Santa Barbara. Coral Casino.

Chairman—Dallas R. McCauley:

2:15- 3:15 P.M. Essay by Robert M. Ricketts.
3:15- 4:15 P.M. Essay by Alton W. Moore.
4:15- 5:15 P.M. Essay by Richard E. Cline.

Tuesday, February 25
Miramar Hotel

Chairman—Dr. John W. Murphy:

9:00-12:00 A.M. Table Clinics ($\frac{3}{4}$ hour to set up for lunch)

Chairman—Herbert V. Muchnic:

1:00- 2:30 P.M. Round-Table Luncheon.
12:00 M. Luncheon for women. Style clinic, of interest to everyone, showing how to build up a wardrobe with different ensembles.

Chairman—John S. Rathbone:

3:00- 4:00 P.M. Essay by Allan G. Brodie.
4:00- 5:00 P.M. Essay by Harold J. Noyes.

Wednesday, February 26
Biltmore Hotel

Chairman—Arnold E. Stoller:

9:00-10:00 A.M. Essay by Andrew Jackson.
10:15-12:00 A.M. General Symposium, Bill Smith, moderator.
12:15- 1:30 P.M. Lunch and business meeting at Coral Casino.

Chairman—Richard E. Cline:

2:00- 5:00 P.M. Limited attendance seminars.

Master of Ceremonies—Walter J. Furie:

6:00 P.M. Cocktails, steak dinner, wonderful entertainment, Montecito Country Club.

General Symposium:

Brodie Elsasser
Jackson Keenan
Noyes Sagehorn
Ricketts Vale
Straub West

Limited-Attendance Seminars:

Riedel Philbrick
Chapman Straub
Ricketts Calmes
Steiner Moore
Cline Brodie
Paden Crawley
Crozat

The essay program is general in character. The essay by Dr. Straub is on tongue function; Dr. Brodie's essay is not appliance therapy and is general in character. Dr. Ricketts will speak on growth as determined by his cephalometric studies. Dr. Moore will speak on Class II, Division 1, and Dr. Cline's essay will be reflections on crowded lower incisors. None of these essays will be aimed at appliance therapy. However, in the limited-attendance clinics appliance therapy will be presented and the members can choose the clinician of their choice. This should offer a program of interest to all orthodontists, regardless of appliance preference.

Rocky Mountain Society of Orthodontists

The annual meeting of the Rocky Mountain Society of Orthodontists will be held Nov. 10 to 13, 1957, at Writers Manor in Denver, Colorado. The program will feature papers

by Faustin N. Weber, Memphis, Tennessee; Nathan G. Gaston, Monroe, Louisiana; and Bob Meyer, Denver, Colorado.

Southwestern Society of Orthodontists

The thirty-seventh annual meeting of the Southwestern Society of Orthodontists was held in Dallas, Texas, Sept. 30 to Oct. 2, 1957. A brief résumé of the program follows.

Invocation. Dr. Pat Henry, Jr.

Address of Welcome. J. Roscoe Tipton, president of the Texas State Dental Association.

Response. Thermon B. Smith, president-elect of the Southwestern Society.

President's Address. Tom M. Williams.

Scientific Papers:

THE LOWER INCISOR—ITS RELATIONSHIP TO TREATMENT AND ESTHETICS.

John T. Lindquist, Indiana University School of Dentistry. (This paper is scheduled for publication in the February issue of the JOURNAL.)

EXTRACTION—STILL THE BIGGEST QUESTION IN ORTHODONTICS. John T. Lindquist.

TIME—MAN'S MOST PRECIOUS ASSET. John T. Lindquist.

MUSCLES AND MALOCCLUSION (three lectures). Robert E. Moyers, School of Dentistry, University of Michigan.

MUTUAL PROBLEMS IN ORTHODONTICS AND ORAL SURGERY. Phillip E. Williams, Oral Surgeon, Dallas, Texas.

Presentation of Martin E. Dewey Memorial Award to Thomas Gunter Duckworth, Boerne, Texas.

Address by William R. Alstadt, president-elect of the American Dental Association.
Business Sessions.

The Constitution and By-Laws were amended for the purpose of creating and defining the functions and duties of the Admissions Committee and the Conference Planning Committee.

Sports Program. Joe D. Peak and W. G. Kennard tied for low score in golf, and W. J. Schoverling won the skeet shoot.

Five applications for membership were received. The newly elected members were welcomed at breakfast in a special ceremony arranged by the committee composed of Clarence Koch, Marion Flesher, and Victor Benton. The new members were introduced to the membership at a later session.

The following committeemen were nominated and elected:

Board of Censors: Leo A. Rogers, Hutchinson, Kansas.

Advisory Committee (Three-year term): Joe D. Peak, Austin, Texas.

Public Relations Committee (Five-year term): Kent W. Jones, Ft. Worth, Texas.

Director of A. A. O.: Nathan G. Gaston, Monroe, Louisiana.

Alternate Director: J. Victor Benton, Wichita, Kansas.

Nominating Committee: Curtis W. Williams, Shreveport, Louisiana, and Don A. Closson, Kansas City, Missouri.

Sectional Editor, American Journal of Orthodontics: W. E. Flesher, Oklahoma City, Oklahoma.

Advisory Committee: One year—Brooks Bell, Dallas, Texas, and Hugh Sims, Tulsa, Oklahoma. Two years—Nathan G. Gaston, Monroe, Louisiana,

and John H. Rogers, Wichita, Kansas. Three years—Clarence Koch, Little Rock, Arkansas, and A. P. Westfall, Houston, Texas.

Martin E. Dewey Memorial Award Committee (Three years): A. B. Conly, Dallas, Texas.

Little Rock was chosen as the place of the 1958 annual meeting.

The following newly elected officers were installed:

President: Thermon B. Smith, Little Rock, Arkansas.

President-Elect: Marcus D. Murphey, Houston, Texas.

Vice-President: John W. Richmond, Kansas City, Kansas.

Secretary-Treasurer: Harold S. Born, Bartlesville, Oklahoma.

Referral of Transfer Cases

So much has been said and written about the public relations hazard of the referral of transfer cases under orthodontic treatment that all discussions of the subject offer some constructive ideas and are usually interesting. The following is the manner in which one specialist handles this phase of practice:

Dear Dr. _____

I would like to refer _____, age _____, son (daughter) of _____ to you for continuation of treatment. He has been under treatment with me since _____ and has been a most cooperative patient. _____ bands and appliances are constructed of chrome alloy. In the maxillary, he is wearing _____

In the mandibular, he is wearing _____

Please feel free to make any appliance changes that you see fit.

The bands were last cemented _____

Financial arrangements for _____ case were as follows:

I have advised the _____ that they should make their financial arrangements with you.

Mrs. _____ is bringing the models and X-rays.

Or

Models and X-rays are being mailed to you separately.

Kindly confirm this letter and advise me if you need any further information. Please say "hello" to _____ for me.

With best regards,

American Association for Cleft Palate Rehabilitation

The American Association for Cleft Palate Rehabilitation will hold its sixteenth annual convention at the St. Francis Hotel in San Francisco, California, on Thursday, Friday, and Saturday, April 24 to 26, 1958.

University of Arkansas

The University of Arkansas has announced the formation of an Institute for Post-Graduate Education in Dentistry. The purpose of the Institute is to promote broadly the advancement of dental education and all related phases of the arts and sciences that contribute directly to the profession.

The Arkansas State Dental Association, which through the years has maintained a comprehensive program of postgraduate training, worked with University officials in designing the Institute and will aid in promoting the various scientific activities.

Plans are now under way for the development of a Registry of Oral Pathology which will serve to further acquaint both dentists and physicians throughout the state with the latest diagnostic and treatment methods for the some sixty-five diseases which occur in the oral cavity. Other programs in research and the basic sciences are being formulated.

The activities of the Institute will be guided by an official Board of Directors named by the University. Directors selected are: Dr. William R. Patterson, Chairman, Texarkana; Dr. Hugh Moseley, Jr., Warren; Dr. Prentiss E. Ware, Ft. Smith; Dr. C. W. Nickels, Walnut Ridge; and Dr. Richard D. Hardin of North Little Rock.

University officials and the officers of the State Dental Association feel that the Institute will make a significant contribution to the health and welfare of the citizens of Arkansas.

Death of Thomas Speidel

Word has reached the JOURNAL of the sudden death of Dr. Thomas Speidel, 49-year-old orthodontist and teacher, of Minneapolis, Minnesota. An obituary will appear later.

OFFICERS OF ORTHODONTIC SOCIETIES

The AMERICAN JOURNAL OF ORTHODONTICS is the official publication of the American Association of Orthodontists and its component societies. The Editorial Board of the JOURNAL is composed of a representative of each of the component societies.

American Association of Orthodontists (Next meeting April 27—May 1, 1958, New York)

President, Franklin A. Squires	- - - - -	Medical Centre, White Plains, N. Y.
President-Elect, Edward C. Martinek	- - - - -	Fisher Bldg., Detroit, Mich.
Vice-President, George H. Siersma	- - - - -	Republic Bldg., Denver, Colo.
Secretary-Treasurer, Earl E. Shepard	- - - - -	8230 Forsyth, St. Louis, Mo.

Central Section of the American Association of Orthodontists (Next meeting Sept. 29-30, 1958, Cedar Rapids)

President, Frederick B. Lehman	- - - - -	1107 Merchants National Bank Bldg., Cedar Rapids, Iowa
Vice-President, Leo B. Lundergan	- - - - -	8000 Bonhomme, St. Louis, Mo.
Secretary-Treasurer, William F. Ford	- - - - -	575 Lincoln Ave., Winnetka, Ill.
Director, Elmer F. Bay	- - - - -	216 Medical Arts Bldg., Omaha, Neb.

Great Lakes Society of Orthodontists (Next meeting Nov. 2-5, 1958, Pittsburgh)

President, Edwin G. Flint	- - - - -	8047 Jenkins Arcade, Pittsburgh, Pa.
Vice-President, Hunter I. Miller	- - - - -	1416 Mott Foundation Bldg., Flint, Mich.
Treasurer, Russell E. Huber	- - - - -	350 Fidelity Medical Bldg., Dayton, Ohio
Secretary, D. C. Miller	- - - - -	40 South Third St., Columbus, Ohio
Director, Robert E. Wade	- - - - -	327 E. State St., Columbus, Ohio
Director, Harlow L. Shehan	- - - - -	601 Jackson City Bank Bldg., Jackson, Mich.

Middle Atlantic Society of Orthodontists

President, Gerard A. Devlin	- - - - -	121 Prospect St., Westfield, N. J.
Vice-President, Kyrle W. Preis	- - - - -	700 Cathedral St., Baltimore, Md.
Secretary-Treasurer, Paul A. Deems	- - - - -	835 Park Ave., Baltimore, Md.
Director, George M. Anderson	- - - - -	3700 North Charles St., Baltimore, Md.

Northeastern Society of Orthodontists (Next meeting April 29, 1958, New York)

President, Clifford G. Glaser	- - - - -	1255 Delaware Ave., Buffalo, N. Y.
Vice-President, Wilbur J. Prezzano	- - - - -	Medical Centre, White Plains, N. Y.
Secretary-Treasurer, David Mossberg	- - - - -	36 Central Park S., New York, N. Y.
Director, Norman L. Hillyer	- - - - -	230 Hilton Ave., Hempstead, L. I., N. Y.

Pacific Coast Society of Orthodontists (Next meeting Feb. 23-27, 1958, Santa Barbara)

President, A. Frank Heimlich	- - - - -	1824 State St., Santa Barbara, Calif.
Vice-President, Donald C. MacEwan	- - - - -	Fourth & Pike Bldg., Seattle, Wash.
Secretary-Treasurer, Raymond M. Curtner	- - - - -	450 Sutter St., San Francisco, Calif.
Director, A. Frank Heimlich	- - - - -	1824 State St., Santa Barbara, Calif.

Rocky Mountain Society of Orthodontists (Next meeting Sept. 7-9, 1958, Moran, Wyo.)

President, George E. Ewan	- - - - -	Bank of Commerce Bldg., Sheridan, Wyo.
Vice-President, Howard L. Wilson	- - - - -	Republic Bldg., Denver, Colo.
Secretary-Treasurer, H. Carlyle Pollock, Jr.	- - - - -	915 South Colorado Blvd., Denver, Colo.
Director, Ernest T. Klein	- - - - -	Republic Bldg., Denver, Colo.

Southern Society of Orthodontists

President, Frank P. Bowyer	- - - - -	608 Medical Arts Bldg., Knoxville, Tenn.
Vice-President, William Weichselbaum, Jr.	- - - - -	115 E. Gwinnett St., Savannah, Ga.
Secretary-Treasurer, H. K. Terry	- - - - -	2742 Biscayne Blvd., Miami, Fla.
Director, Edgar Baker	- - - - -	Professional Bldg., Raleigh, N. C.

Southwestern Society of Orthodontists
(Next meeting Oct. 5-8, 1958, Little Rock)

President, Thermon B. Smith - - - - - 1122 W. Capitol, Little Rock, Ark.
Vice-President, John W. Richmond - - - - 493 Brotherhood Bldg., Kansas City, Kan.
Secretary-Treasurer, Harold S. Born - - - - 908 S. Johnstone, Bartlesville, Okla.
Director, Nathan Gaston - - - - - 701 Walnut St., Monroe, La.

American Board of Orthodontics

President, Lowrie J. Porter - - - - - 41 East 57th St., New York, N. Y.
Vice-President, William R. Humphrey - - - - Republic Bldg., Denver, Colo.
Secretary, Wendell L. Wylie - - - - University of California School of Dentistry, The Medical Center, San Francisco, Calif.
Treasurer, Jacob A. Salzmann - - - - - 654 Madison Ave., New York, N. Y.
Director, L. Bodine Higley - - - - University of North Carolina, Chapel Hill, N. C.
Director, B. F. Dewel - - - - - 708 Church St., Evanston, Ill.
Director, Frank P. Bowyer - - - - - 608 Medical Arts Bldg., Knoxville, Tenn.

A List of the Orthodontic Societies of the World and Their Principal Officers*

Angle Society of Orthodontia

Secretary, George W. Hahn - - - - - 2300 Durant Ave., Berkeley, Calif.
Treasurer, Carl F. Bruggeman - - - - - 10845 Lindbrook Dr., Los Angeles, Calif.

Chicago Association of Orthodontists

President, George L. Christopher - - - - - 9504 S. Hamilton, Chicago, Ill.
President-Elect, Ben Herzberg - - - - - 7200 Exchange Ave., Chicago, Ill.
Secretary-Treasurer, Russell K. Ephland - - - - 3 S. Prospect Ave., Park Ridge, Ill.

Orthodontic Alumni Society of Columbia University

President, Walter G. Spengeman - - - - - 20 S. Broadway, Yonkers, N. Y.
Vice-President, Herbert Fine - - - - - 10 Fiske Pl., Mount Vernon, N. Y.
Secretary, Harry Newman - - - - - 194 Smith St., Freeport, N. Y.
Treasurer, Stanley Wein - - - - - 285 Central Ave., Lawrence, N. Y.

Harvard Society of Orthodontists

President, Ben Wayburn - - - - - 67 Coddington St., Quincy, Mass.
Vice-President, Clifford Hunt - - - - - 14 Muzzy St., Lexington, Mass.
Treasurer, Bernard Rogell - - - - - 6 Pleasant St., Malden, Mass.
Secretary, Milton J. Meyers - - - - - 281 Haverhill St., Lawrence, Mass.

Kansas State Orthodontic Society

President, J. Victor Benton - - - - - 1208 Union National Bldg., Wichita, Kan.
President-Elect, John W. Richmond - - - - 493 Brotherhood Bldg., Kansas City, Kan.
Secretary-Treasurer, Howard H. Dukes - - - - 754 Brotherhood Bldg., Kansas City, Kan.

New York Society for the Study of Orthodontics

President, Irving Lederman - - - - - 45-54 41st St., Long Island City, N. Y.
Vice-President, Leon Gecker - - - - - 305 West 72nd St., New York, N. Y.
Secretary-Treasurer, Nathan J. Sachs - - - - 84-75 168th St., Jamaica, L. I., N. Y.

New York University Orthodontic Society

President, Benjamin Falk - - - - - 2742 Pitkin Ave., Brooklyn, N. Y.
Vice-President, Jerome D. Teitelbaum - - - - 163 E. 178th St., New York, N. Y.
Secretary-Treasurer, Irwin Forster - - - - 501 Madison Ave., New York, N. Y.

*In the January issue of the AMERICAN JOURNAL OF ORTHODONTICS is published each year a list of the orthodontic societies of the world of which the JOURNAL has any record, along with the names and addresses of their principal officers.

The JOURNAL keeps a file for each of these societies and publishes the names that appear in that file as of the date of going to press.

Oklahoma Orthodontic Society

President, George R. Webber - - - - - Broadway Tower Bldg., Enid, Okla.
President-Elect, Robert H. Knarr - - - - - 816 Medical Arts Bldg., Tulsa, Okla.
Secretary-Treasurer, George E. Mindeman - - Utica Square Medical Center, Tulsa, Okla.

Philadelphia Society of Orthodontists

President, Herbert K. Cooper - - - - - 26 N. Lime St., Lancaster, Pa.
Secretary-Treasurer, Warren Bieler - - - - 1208 Medical Arts Bldg., Philadelphia, Pa.

St. Louis Society of Orthodontists

President, Everett W. Bedell - - - - - 1504 S. Grand Blvd., St. Louis, Mo.
Vice-President, R. C. Byrne - - - - - 2602 S. Grand Blvd., St. Louis, Mo.
Secretary-Treasurer, Robert E. Hennessy - - - 8013 Maryland Blvd., St. Louis, Mo.

Orthodontic Section of Canadian Dental Association

Chairman, Gerald Franklin - - - - - Drummond Medical Bldg., Montreal, Quebec
Vice-Chairman, Ira Hamilton - - - - - Medical Arts Bldg., Ottawa, Ontario
Secretary-Treasurer, Walter Swiston - - - 4637 Sherbrooke St., W., Montreal, Quebec

Toronto Orthodontic Club

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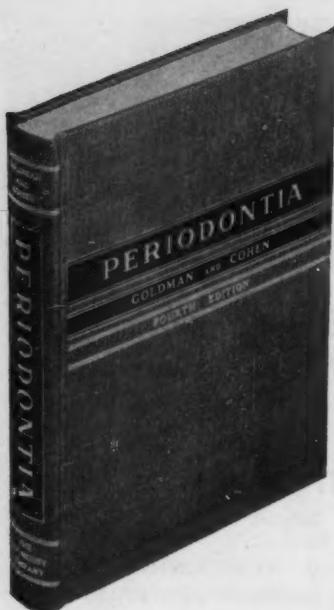
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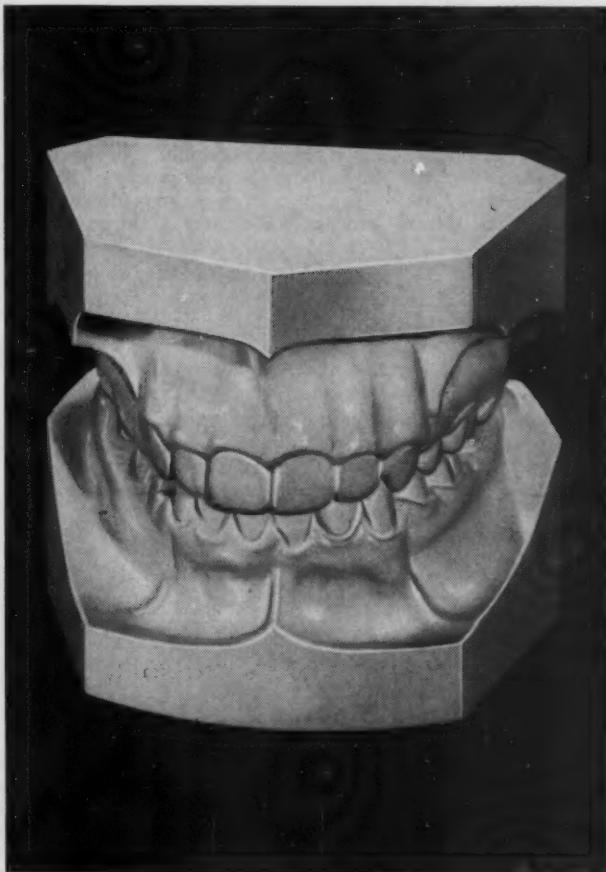


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If price is a factor in selection, do not fail to buy No. 12 Clasp. It is moderately priced, yet its physical properties are surprisingly close to those of the top-grade wires and place it definitely above the wires in its price group. It is tough, strong, temperable, with fatigue strength comparable to the best grade wires. For all orthodontic purposes.

BAND MATERIAL C

Gold color; fusing temperature 1825° F.

Popular for more than three decades among men employing the lingual arch techniques. It is temperable, works nicely; is strong with excellent edge strength.

METALBA BAND MATERIAL

Platinum color; fusing temperature 2470° F.

This band material cannot be praised too highly. It works beautifully—may be considered soft—and is indestructible in ordinary gas and air blowpipe flames. You cannot melt it, or discolor it in the flame or in the acids to which it will be subjected in normal orthodontic use. It is tough, strong; is in the low priced field, yet definitely above its price group.

If your dealer does not carry all S. S. White Orthodontic items you need, send your order to us with his name. Order cards, catalogs, and price lists will be mailed upon request.

THE S.S.WHITE DENTAL MFG. CO., PHILADELPHIA 5, PA.